

US 2/97 CORRIDOR SAFETY STUDY

TRAFFIC EXISTING CONDITIONS

**Data Resources
Traffic Operations
Traffic Safety Review
Traffic Forecasts
Future Baseline Operations**

Prepared for:

**Washington State Department of Transportation
WSDOT North Central Region**

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Celebrating 25 Years of Service

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Appendices

NOTE: The appendices listed below are not included in website document. Please contact Kirk Berg, WSDOT Project Engineer at 509-667-2870, to review these appendices.

Appendix A - Current Traffic Operations Analysis Data
Appendix B - Safety Analysis
Appendix C - Corridor Traffic Forecasts
Appendix D - Forecasted Turning Movement Volumes
Appendix E – Future Baseline Operations Analysis Data

INTRODUCTION

The purpose of the traffic analysis for the US 2/97 Corridor Safety Study is to identify current traffic issues and to identify future deficiencies in the roadway and intersection network along the US 2/97 corridor for the 20-year horizon. The US 2/97 Corridor Safety Study includes the section of highway between US 2 and US 97 junction (Blewett Junction) MP 104.72 and US 2/97 intersection with Easy Street MP 119.13 in Wenatchee. Chapter 1 is an overview of Data Resources, presented with a summary of existing information available and studies related to the project. Chapter 2 is a summary of the current Traffic Operations for the intersections along the US 2/97 corridor, with description of the roadway network connections to US 2/97 in the study area. Chapter 3 is the Traffic Safety Review of the corridor with summary of accident history by intersection and for roadway sections on US 2/97. Chapter 4 documents the methodology for forecasting future traffic along the US 2/97 corridor. Chapter 5 provides an evaluation of future traffic operations and deficiencies.

DATA RESOURCES

The analyses and forecasts for the US 2/97 Corridor Safety Study Traffic Existing Conditions Report are based upon information collected from a variety of sources. The project analysis staff collected information from documents, meetings and telephone conversations, as well as field visits throughout the study area. The following discussion presents the resources and references examined in this study along with a summary of the information gathered. This section is organized to present the information and traffic resources in the following order: traffic count data, historical accident data, planning documents and forecast data, plus previous studies and analyses.

Traffic Count Data

Washington State Department of Transportation (WSDOT) staff provided traffic volume counts throughout the study area. The data is a combination of daily and peak period turning movement counts at key locations through the US 2/97 corridor study area. Week-long roadway volume counts and peak-period manual turning movement counts taken over a two-week period in August 2000. Supplemental daily and peak period counts were performed in the Blewett Junction area and at Easy Street in the Wenatchee area in April 2001. The August 2000 counts were timed to reflect a combination of high tourist traffic and local travel demands through the corridor.

The 2000 peak-period turning movement counts were performed for the AM and PM peak three hour periods at 15 of the 16 intersections listed below. Additional counts were performed in March 2001 at near Blewett Junction at the Blewett Cutoff Road intersection. Current traffic counts were not available for the intersection of Saunders Road/Deadman Hill Road/Foster Road at US 2/97. Based on an historical growth data, four percent annual growth rate was applied to Saunders Road/Deadman Hill Road/Foster Road to estimate a 2000 baseline for analysis.

US 2/97 Intersections:

- Blewett Junction (US 97) and Jeske Road
- Saunders Road/Deadman Hill Road/
Foster Road
- Motel Road and Dryden Transfer Station Road
(no turning movement counts)
- Alice Avenue
- Dryden Avenue/Johnson Road
- North Dryden Road/Pinnacle View Drive
- Goodwin Road/Hay Canyon Road
- Aplets Way
- Cotlets Way
- Old Monitor Road
- Old Monitor Road/Red Apple Road
- Red Apple Road/Selfs Road
- Main Street/Easy Street
- Lower Sunnyslope Road
- School Street
- Easy Street

Additional intersections counted include US 2 at Doghouse Road/Blewett Cutoff Road and US 97 at Blewett Cutoff Road.

The peak hour of the roadway facility varies by location along the corridor, with earlier afternoon peak hours (beginning at 3:00 p.m.) near the west end of the study area and increasing to later afternoon peak hours (beginning at 4:45 p.m.) closer to Wenatchee. These differences reflect the variety of travel uses and the character of the travel demand in the corridor. Travel on US 2/97 is a mixture of agricultural, commuter, commercial, retail/business, and tourism traffic. A single peak hour could not be identified that could adequately show volumes within the corridor. Instead, individual peak hours for each intersection were documented for the study and used in analysis, to address the worst case traffic needs for the corridor.

Historical daily traffic volume data was available from several issues of the WSDOT's *Annual Traffic Report* for years ranging from 1979 through 1999. This report provides annual average daily traffic volumes at different locations of the state highway system including 15 locations within the US 2/97 corridor. This data was used to help estimate the historical traffic growth through the corridor and to better understand growth trends within the study area.

Historical Accident Data

WSDOT provided a summary of reported accidents for the years 1994 through 2000 for use in the safety review for the corridor. During the seven-year period, a total of 526 reported accidents occurred over the 14.4-mile corridor. Due to a statewide reporting problem, only the 1994 to 1996 data is complete and sufficient for full analysis. The 1997 to 2000 data does not fully reflect the number of reported accidents and is not sufficient for any evaluation of accident rates or trends. An estimated 30 percent of the reported accidents occurring between 1997 and 1999 have not been entered into the system. Additionally, it was noted that the reported accidents for 2000 were only in the months of January, February, and March.

The whole seven-year period of accidents have been summarized, along with a collective accident rate for the three full years of data. The limited accident data available limits the conclusions from an examination of the accident history of the corridor. A review of common accident types by location and an assessment of possible remedies to prevent the predominant accident types was completed. Further feasibility analysis of long-range improvements to the US2/97 corridor should include additional review of more complete and recent accident data.

Planning Documents and Forecast Data

US 97 Route Development Plan, December 2000, Washington State Department of Transportation, North Central Region

This document is a graphical representation of the route through the North Central Region with brief summary of current conditions, deficiencies, and long-term facility improvements for the route. For the combined US 2/97 facility, the identified plan is for grade separated interchanges to be constructed in order to replace and/or reconfigure the existing intersections. This is the foundation for the current study.

Chelan County Comprehensive Plan, February 2000

Six-Year Transportation Program, 2001-2006, Chelan County Public Works

The Chelan County Comprehensive Plan provides a detailed review of expected land use changes in Chelan County and a brief overview of the County roadway needs. The report identifies US 2/97 as a major route through the Wenatchee River Valley project area. Growth rates for roadway traffic volumes are referenced with generalized conclusions regarding roadway operations. The County's current Capital Improvement Program list includes two projects within the study area: West Cashmere Bridge replacement (Goodwin Road Bridge) and West Monitor Bridge (eastbound off-ramp to Stoffel Road). The replacement plans for both of these bridges are currently on-hold pending the outcome of this study.

City of Cashmere Comprehensive Land Use Plan, 1995

This document provides detailed information about the current conditions of City of Cashmere streets and roadways with recent daily traffic count information for arterials and collector streets. Population growth rates range from low (0.65 percent per year) to high (over two percent per year) reflecting a range

of trends based on historical population growth, build-out potential for the approved land use and other views of community growth potential.

Port of Chelan County Draft Comprehensive Plan, November 1999

The Port of Chelan County operates airport, rail and water facilities within the County to facilitate the movement of goods and agricultural products. Economic forecasts and conditions are reflected in the Draft Comprehensive Plan.

Studies and Analyses

West Monitor Bridge Feasibility Study, December 1998

This report documents the evaluation of the West Monitor Bridge over the Wenatchee River. The bridge load rating is limited to four tons and it is recommended that the bridge be replaced. An estimated 1100 daily vehicle trips would use the bridge in the year 2017, based on the analysis in the feasibility study. The bridge provides a connection between US 2/97 and the west areas of Monitor. No other arterial route connects Cashmere and Monitor so close to the Wenatchee River on the south side of US 2/97 and it is important to maintain that connection.

Titchenal Way Intersection Improvements, 1997, City of Cashmere

City of Cashmere staff has developed several options for intersection improvements and additional connections between Titchenal Way and US 2/97 near the Cotlets Way signalized intersection. Coordination is ongoing between City of Cashmere and WSDOT staff to investigate possible improvements for the many conflicting traffic movements near the Cotlets Way and US 2/97 intersection. It is important to have good access for trucks to Titchenal Way from the Cotlets Way intersection, for deliveries to the Tree Top plant and other businesses located on this cul-de-sac. The city would like to see a slip ramp for traffic from Titchenal Way to eastbound US 2/97 to help alleviate the congestion near the traffic signal. Other options include adding channelization to clarify traffic movements and lanes at the intersection of Titchenal Way and Cotlets Way. These options are possible treatments and input to the US 2/97 Corridor Safety Study in development of alternatives for the corridor.

CURRENT TRAFFIC OPERATIONS

This section provides a discussion of the current operating characteristics of US 2/97 including access, Level of Service (LOS) analysis, and roadway networks within the vicinity. This study also looks at one intersection to the south and one intersection to the west of the project limits to include the intersections of US 97/Blewett Cutoff and US 2/Blewett Cutoff/Doghouse Road.

Access

US 2/97 is a four-lane, partial control, limited access facility. There are two lanes in each direction that are separated by various means: barriers, paved medians and turn-pockets. Either guardrail or concrete barrier is located in the median except at intersections and in the following segments:

- US 97 junction to Saunders Road/Deadman Hill Road/Foster Road
- Alice Avenue to railroad structure
- Railroad structure to Aplets Way

The section of concrete barrier between Saunders Road/Deadman Hill Road/Foster Road and Alice Avenue forces Motel Road and Dryden Transfer Station Road to be right in/right out only.

The side streets on US 2/97 are mainly stop-controlled with signalized intersections at Cotlets Way (Cottage Avenue) in Cashmere, Main Street/Easy Street in Monitor, and Easy Street in the Wenatchee vicinity. A traffic signal at Aplets Way (Division) is anticipated for installation this year. Throughout the corridor there are occasional driveways accessing either an orchard, home, or group of homes. Some of these driveways have secondary access at other locations.

Level of Service Analysis

The methodology for the LOS analysis was to identify the PM peak hour for each intersection along US 2/97 within the study area. Individual peak hours were used instead of a single peak hour for the corridor since the current traffic counts for the key intersections indicate a variety of peak hours in the PM time period (there is no concurrent “peak hour” for the corridor as a whole). The differences between peak hours illustrate the differing traffic characteristics throughout the route, with a combination of goods movements, farm-based travel, tourist travel, early start jobs located along the route and regular schedule office-based jobs in Wenatchee. Peak hours range from the 2:45 p.m. hour to the 4:45 p.m. hour. The resulting analysis based on individual peaks will represent the most constrained traffic operation for each intersection, which better identifies current intersection needs. **Figure 2-1** illustrates the traffic volumes, channelization and peak hour used for each intersection.

The Highway Capacity Software (HCS) 2000 version 4.1 was used to analyze the LOS for stop-controlled intersections, signalized intersections, ramp sections and roadway segments along US 2/97. WSDOT’s minimum LOS standard is LOS C for this area. The table below illustrates the LOS for unsignalized intersections within the study limits. This table shows the LOS for affected movements and for each stop-controlled approach. The LOS for the mainline approaches is either A or B, while the LOS for the side street approaches is much worse. While the capacity of US 2/97 is sufficient for mainline traffic volumes, motorists coming from side streets have difficulty finding sufficient gaps in mainline traffic to make their desired maneuver.

Figure 2-1. Traffic Volumes, Channelization and Peak Hour Used for Each Intersection (1 of 6 cont.)

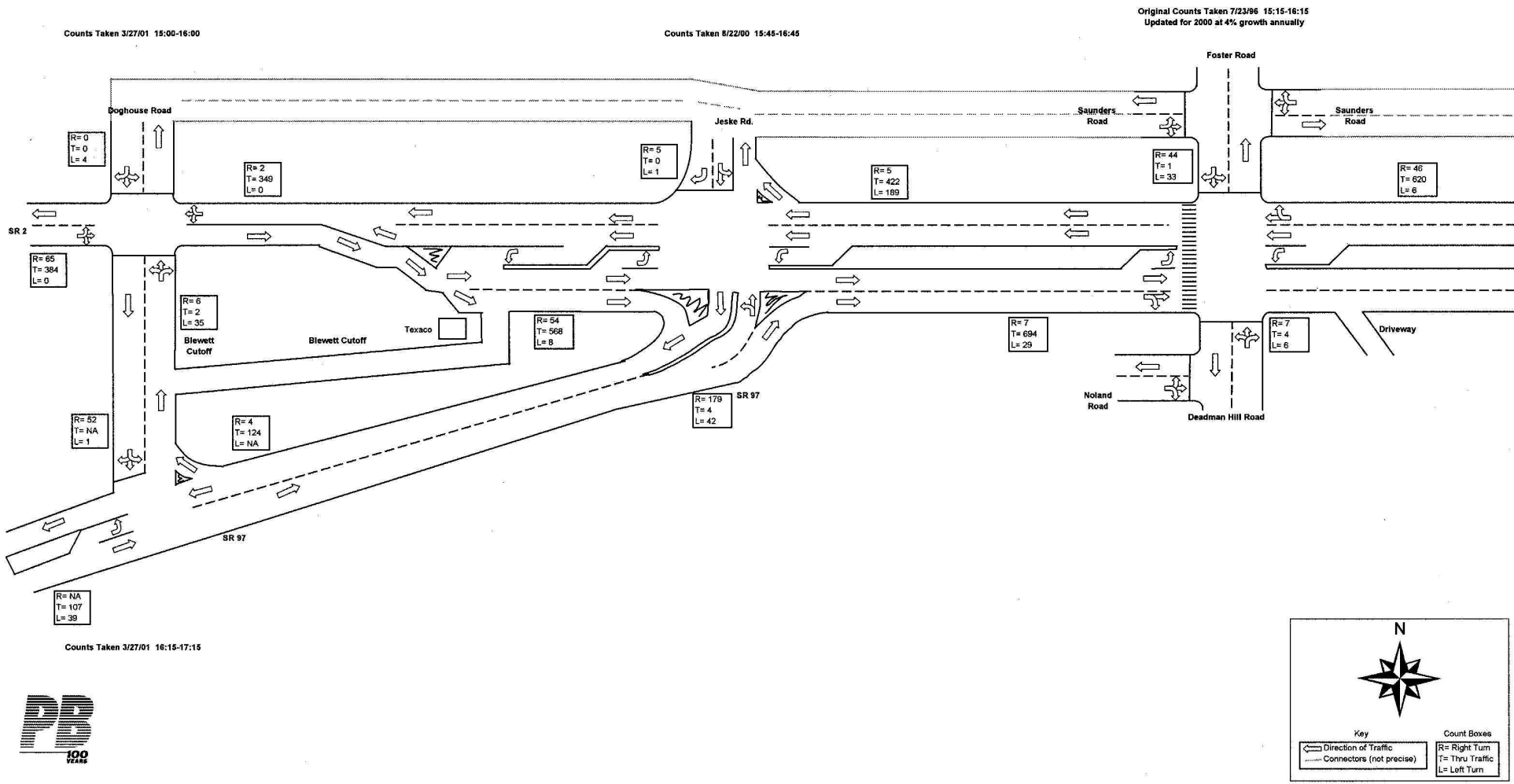


Figure 2-1. Traffic Volumes, Channelization and Peak Hour Used for Each Intersection (2 of 6 cont.)

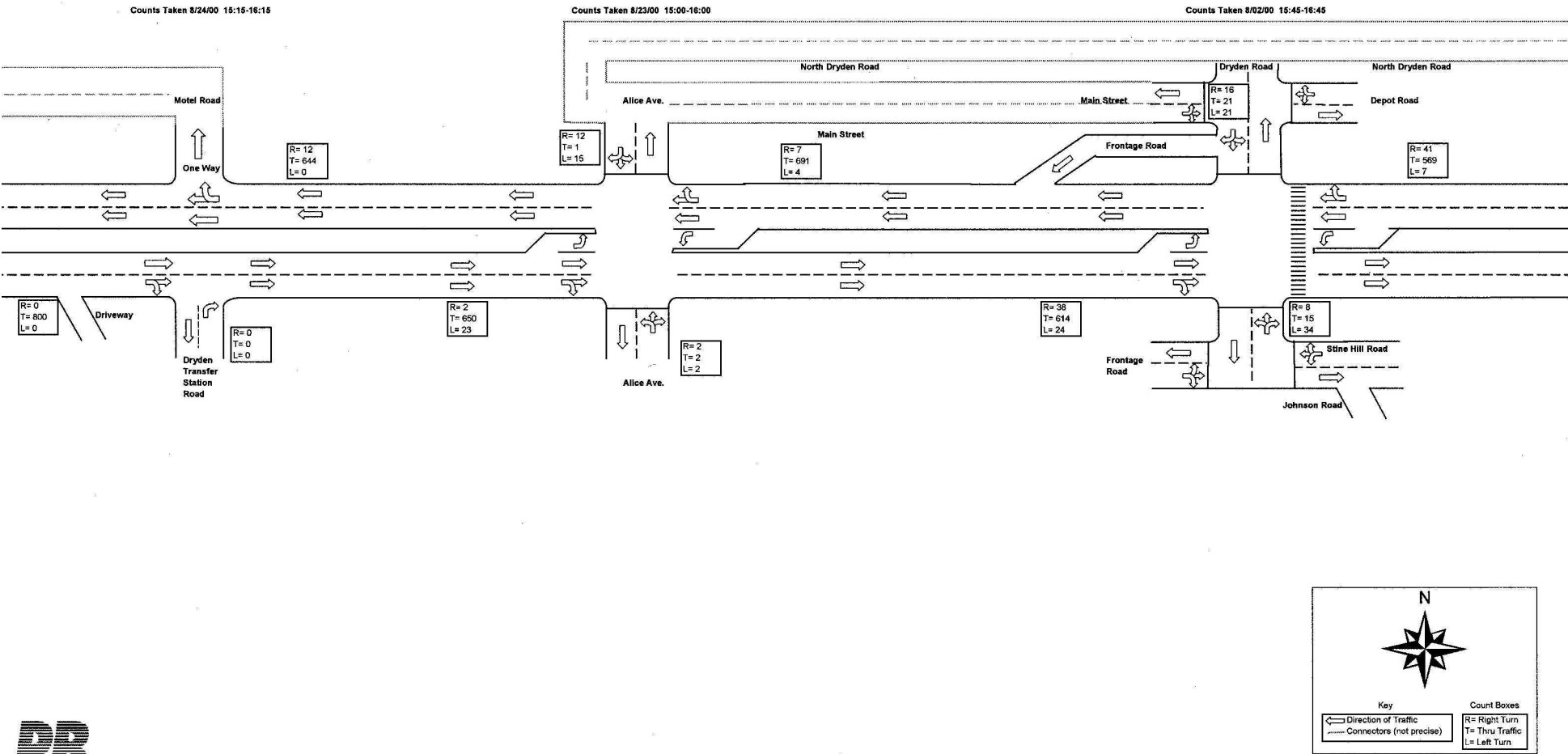


Figure 2-1. Traffic Volumes, Channelization and Peak Hour Used for Each Intersection (3 of 6 cont.)

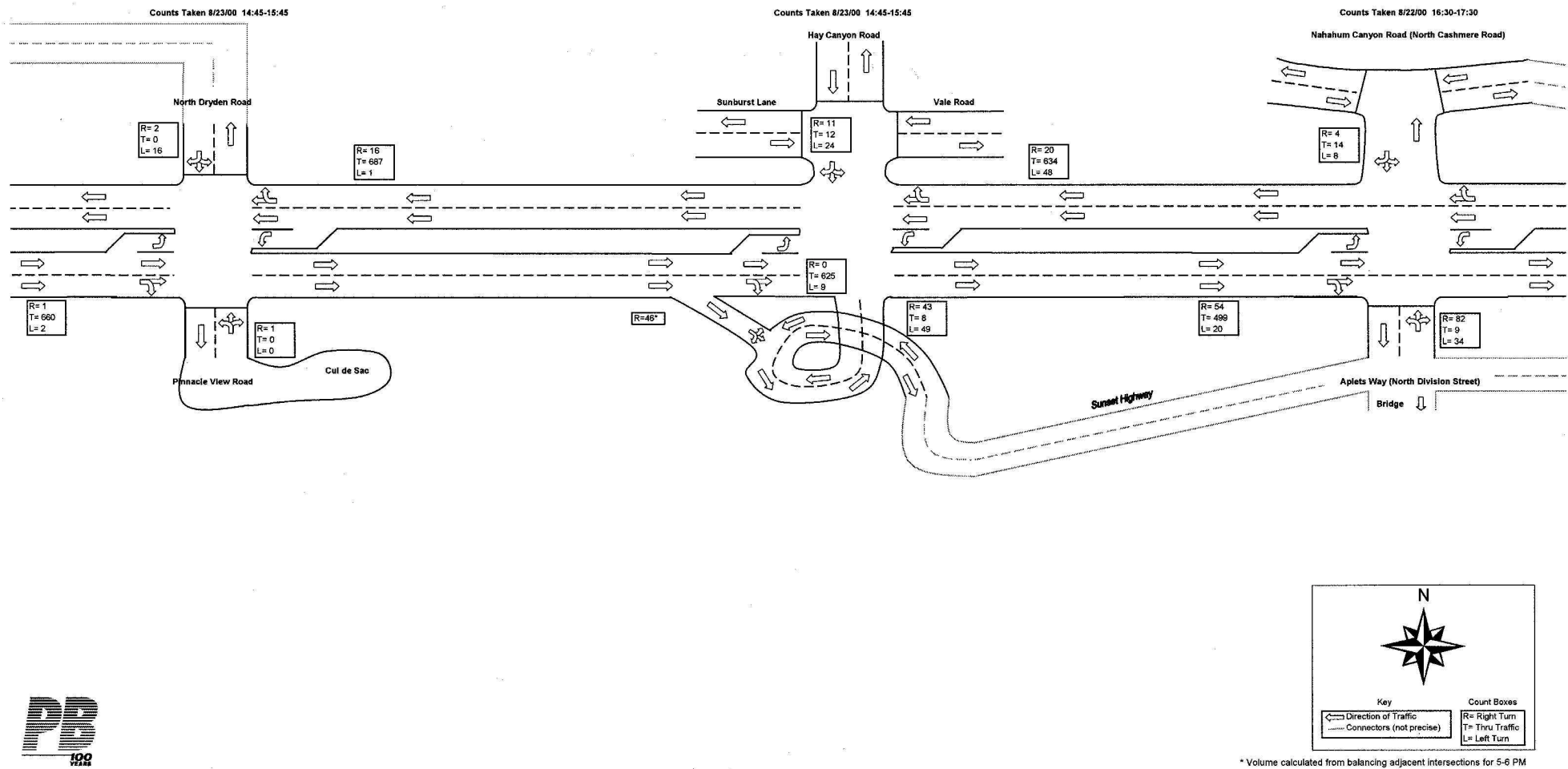


Figure 2-1. Traffic Volumes, Channelization and Peak Hour Used for Each Intersection (4 of 6 cont.)

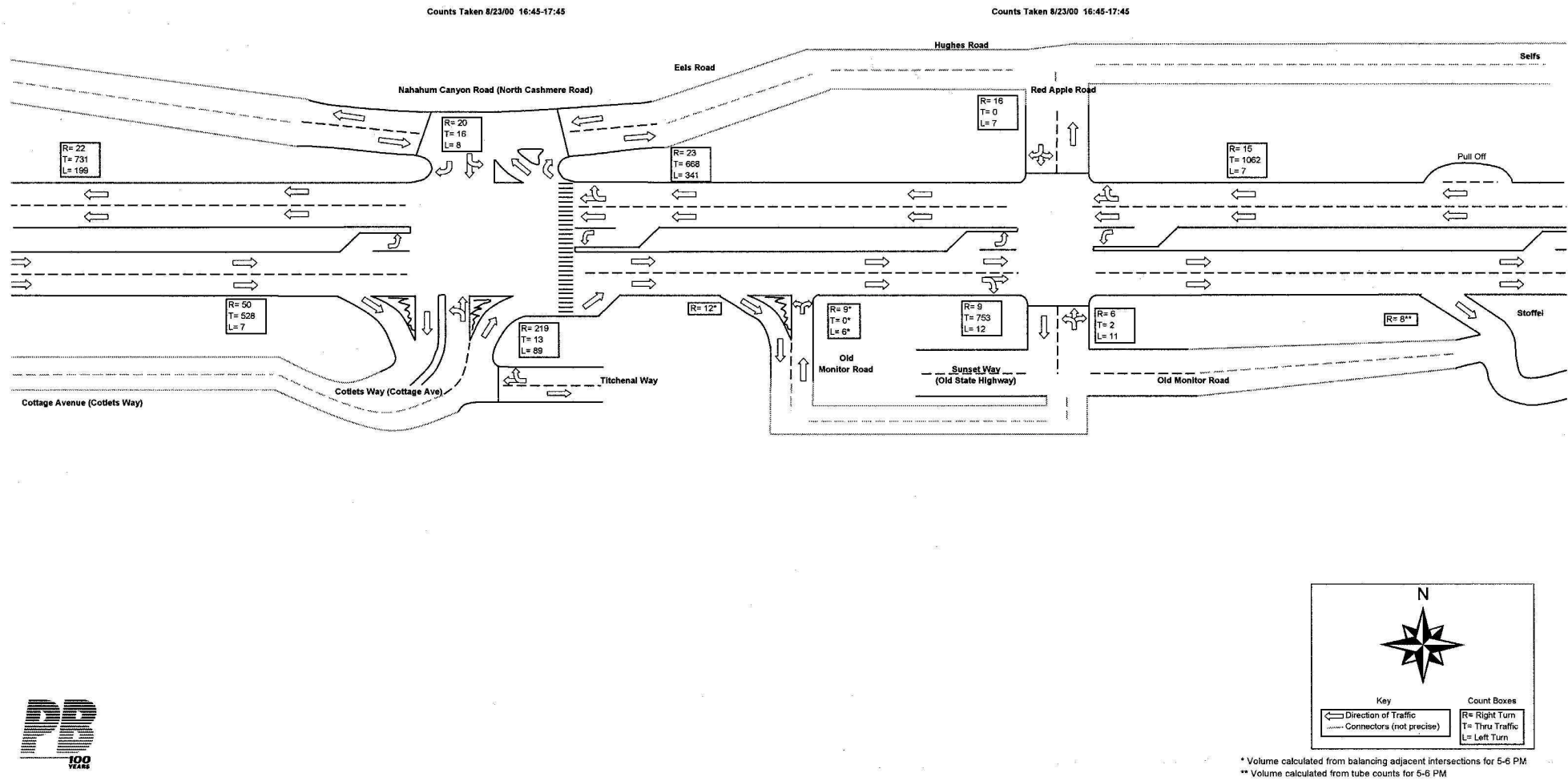


Figure 2-1. Traffic Volumes, Channelization and Peak Hour Used for Each Intersection (5 of 6 cont.)

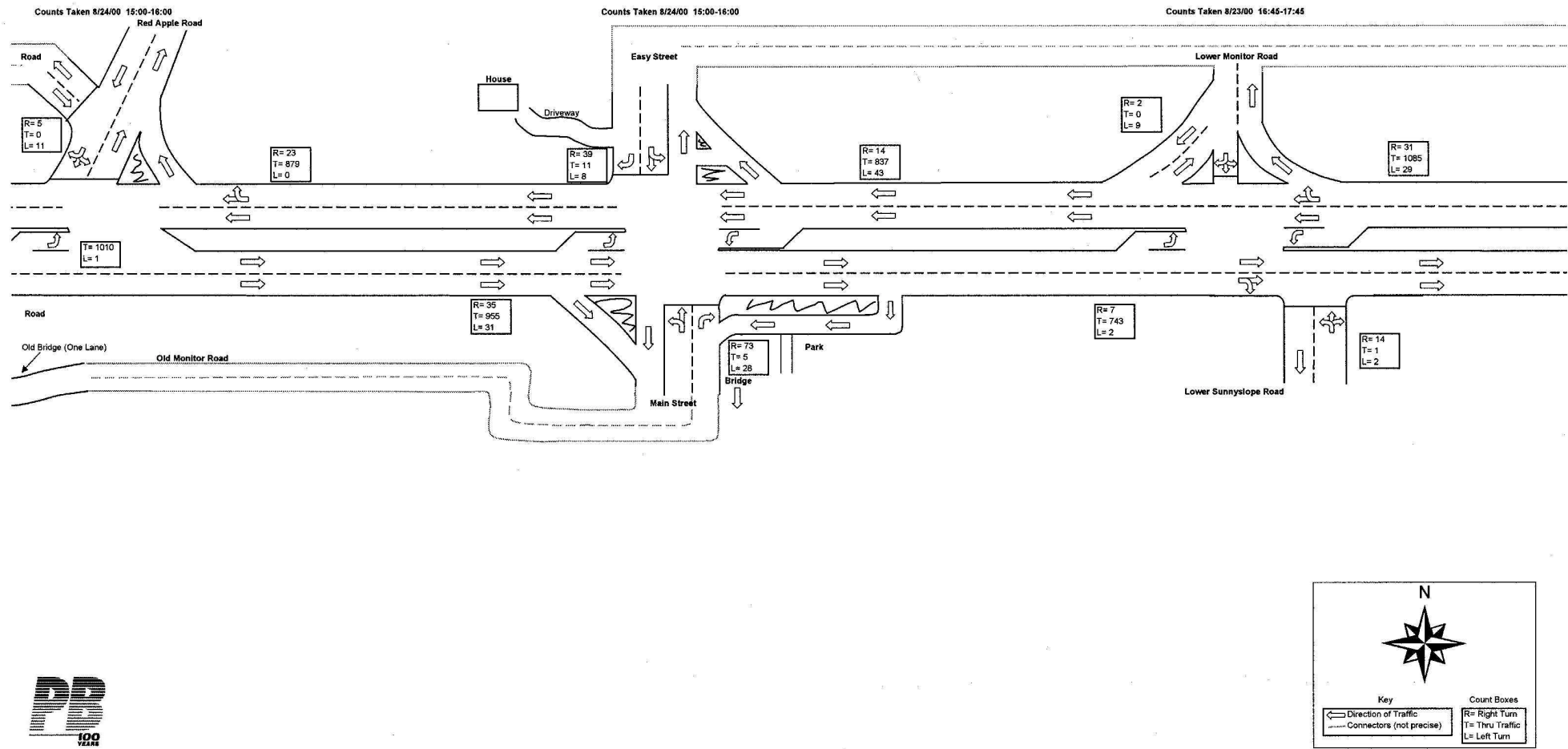


Figure 2-1. Traffic Volumes, Channelization and Peak Hour Used for Each Intersection (6 of 6 cont.)

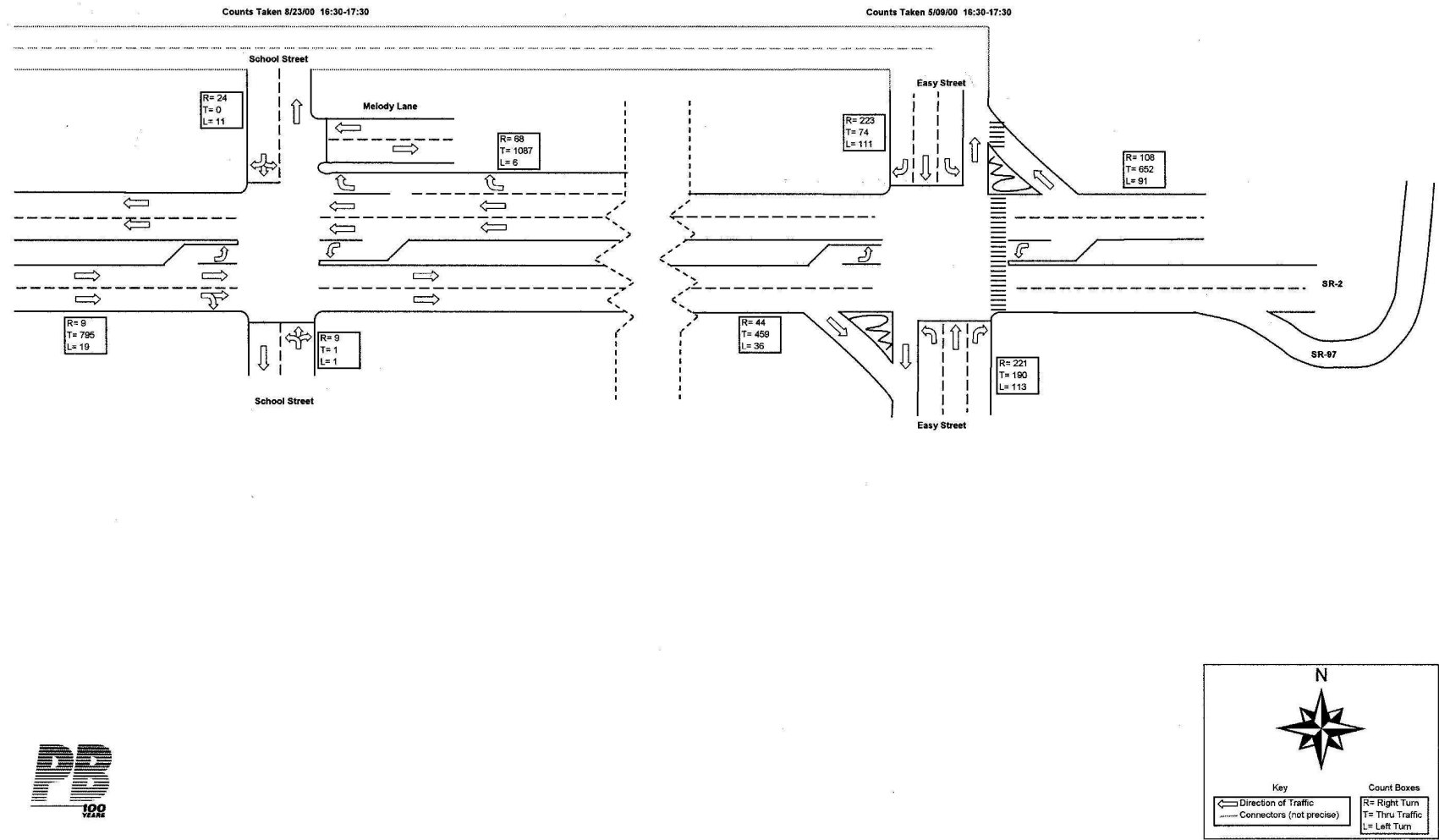


Table 2-1. Level of Service for Unsignalized Intersections

	US 2/97 Eastbnd	US 2/97 Westbnd	Northbound			Southbound			Approach LOS	
	Left	Left	Left	Thru	Right	Left	Thru	Right	NB	SB
US 97 and Blewett Cutoff	A*	---	---	---	---	B**	---	A**	---	A**
US 2 and Blewett Cutoff/Doghouse Road	A	A	---	C	---	---	C	---	C	C
US 2 and Jeske Road/US 97	A	B	---	F	C***	---	F	A	E***	D
Saunders Road/Deadman Hill Road/Foster Road	A	A	---	D	---	---	C	---	D	C
Motel Road/Dryden Transfer Station Road	---	---	---	---	---	---	---	---	A****	
Alice Avenue	A	A	---	C	---	---	C	---	C	C
Dryden Road/Johnson Road	A	A	---	E	---	---	D	---	E	D
North Dryden Road/Pinnacle View Road	A	A	---	B	---	---	D	---	B	D
Goodwin Road/Hay Canyon Road	A	A	---	E	---	---	E	---	E	E
Aplets Way	A	A	---	F	---	---	F	---	F	F
Old Monitor Road	---	---	---	D	---	---	---	---	D	---
Old Monitor Road/Red Apple Road	B	A	---	E	---	---	D	---	E	D
Red Apple Road/Selfs Road	B	---	---	---	---	---	D	---	---	D
Lower Sunnyslope Road	B	A	---	C	---	---	F	B	C	F
School Street	B	A	---	C	---	---	D	---	C	D

* Northbound for the US 97/Blewett Cutoff Intersection

** Eastbound for the US 97/Blewett Cutoff Intersection

*** HCS unable to accurately analyze exclusive receiving lane for NBR

**** No volumes for the side street movements

At the unsignalized intersections of Goodwin Road and Stoffel Road, the “eastbound exits” can best be described as slip ramps. These slip ramps were analyzed using HCS ramp analysis methodology. The resulting LOS for these locations is shown below. The LOS for both of these locations is LOS A.

Table 2-2. Ramp Analysis

	Volume	Ramp LOS
Goodwin Road (eastbound)	46	A
Stoffel Road (eastbound)	8	A

LOS for the three signalized intersections was determined using the planning feature of HCS 2000 to develop the signal timings for the existing signal phasing. The resulting signal timings were then input into the operational feature of HCS 2000 to calculate the LOS for the existing signal phasing. The table below shows the LOS per movement and for the entire intersection. As can be seen in the table, each of the existing intersections appears to operate at satisfactory LOS.

Table 2-3. Level of Service for Signalized Intersections

	Eastbound	Westbound	Northbound	Southbound	Intersection LOS	Intersection Delay (sec)
Cotlets Way	C	B	C	D	C	27
Main Street/Easy Street	B	B	C	C	B	19
Easy Street (Wenatchee)	C	C	C	C	C	32

Roadway sections between each key intersection were also analyzed along US2/97 using HCS 2000. The resulting LOS is LOS A at all locations except for in the westbound direction between School Street and Easy Street (in the Wenatchee vicinity), which operates at LOS B.

Table 2-4. Roadway Level of Service

	Eastbound		Westbound	
	Volume	LOS	Volume	LOS
Blewett Cutoff to Jeske Road	630	A	469	A
Jeske Road to Saunders Road	748	A	670	A
Saunders Road to Motel Road	800	A	672	A
Motel Road to Alice Avenue	800	A	705	A
Alice Avenue to Dryden Road	676	A	702	A
Dryden Road to North Dryden Road	663	A	689	A
North Dryden Road to Hay Canyon Road	677	A	704	A
Hay Canyon Road to Aplets Way	692	A	769	A
Aplets Way to Cotlets Way	589	A	952	A
Cotlets Way to Old Monitor/Red Apple	774	A	1089	A
Red Apple to Red Apple/Selfs Road	1011	A	1084	A
Red Apple to Main Street/Easy Street	1021	A	904	A
Easy Street to Lower Sunnyslope	1036	A	1089	A
Lower Sunnyslope to School Street	823	A	1145	A
School Street to Easy Street (Wenatchee)	815	A	1161	B

Network Connections

The roadway network detailed below provides access to US 2/97 via alternate routes and access points. The roadway connections are described in a west to east direction. See **Figure 2-2** for a map of roadway locations.

1. **Blewett Cutoff:** This roadway runs from US 97 (just south of the US 2 and US 97 junction) north to US 2 (just west of the US 2 and US 97 junction). It is a narrow local access road with no shoulders or striping. At the intersections of Blewett Cutoff and adjacent highways, Blewett Cutoff is stop-controlled.
2. **Jeske Road/Saunders Road:** This route runs north of the highway from the US 2 and US 97 intersection. Jeske Road has two lanes and stop-controlled at Saunders Road. Saunders is a two-lane roadway with a small concrete bridge with signs of disrepair approximately 500 feet south of Jeske Road. Saunders Road was part of the old Sunset Highway.
3. **Foster Road/Motel Road:** This route is north of the highway and can be accessed by Saunders Road off of the highway or continued from the previous route. Both Foster and Motel roads are narrow two-lane local access roads.

Figure 2-2. Network Connections

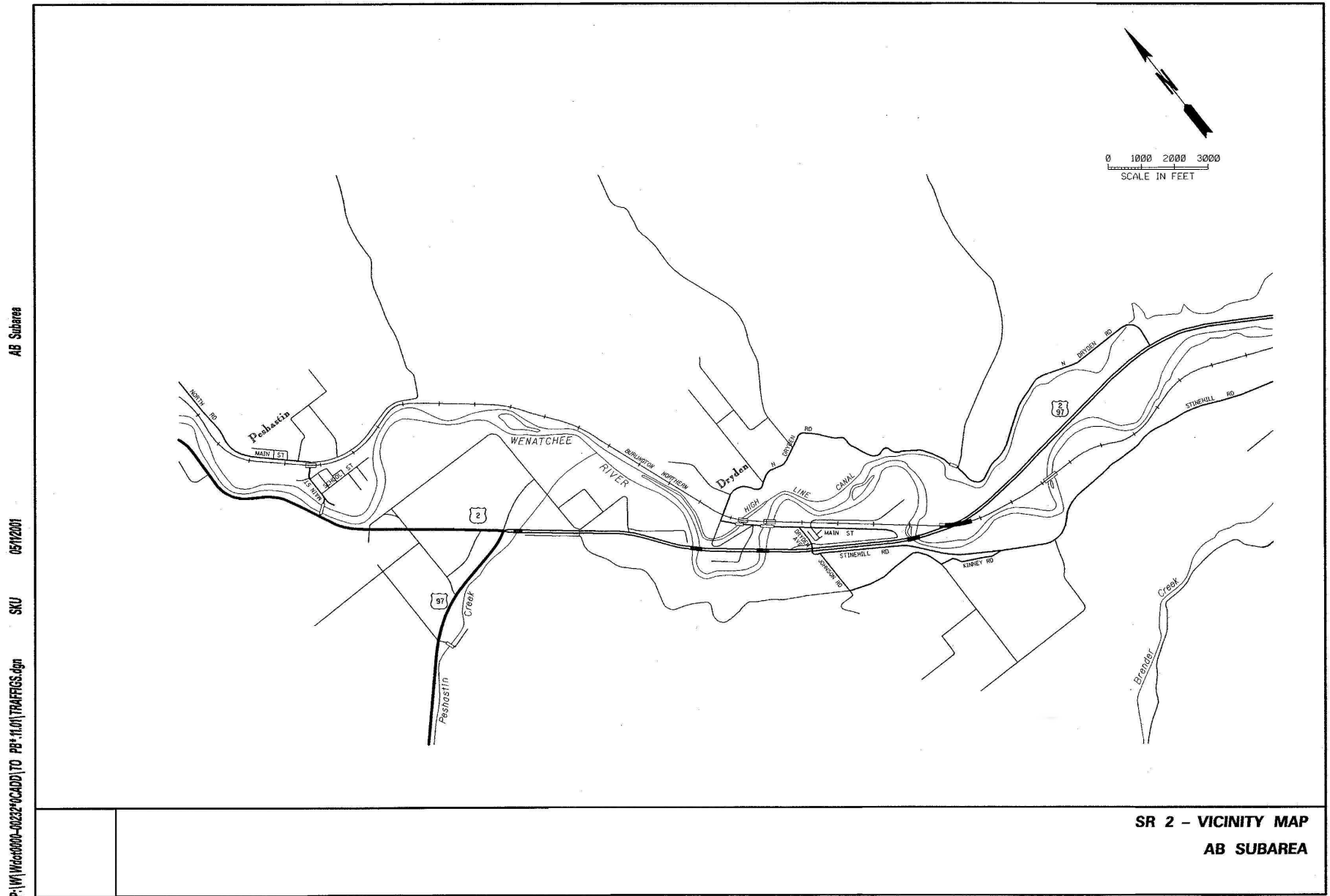
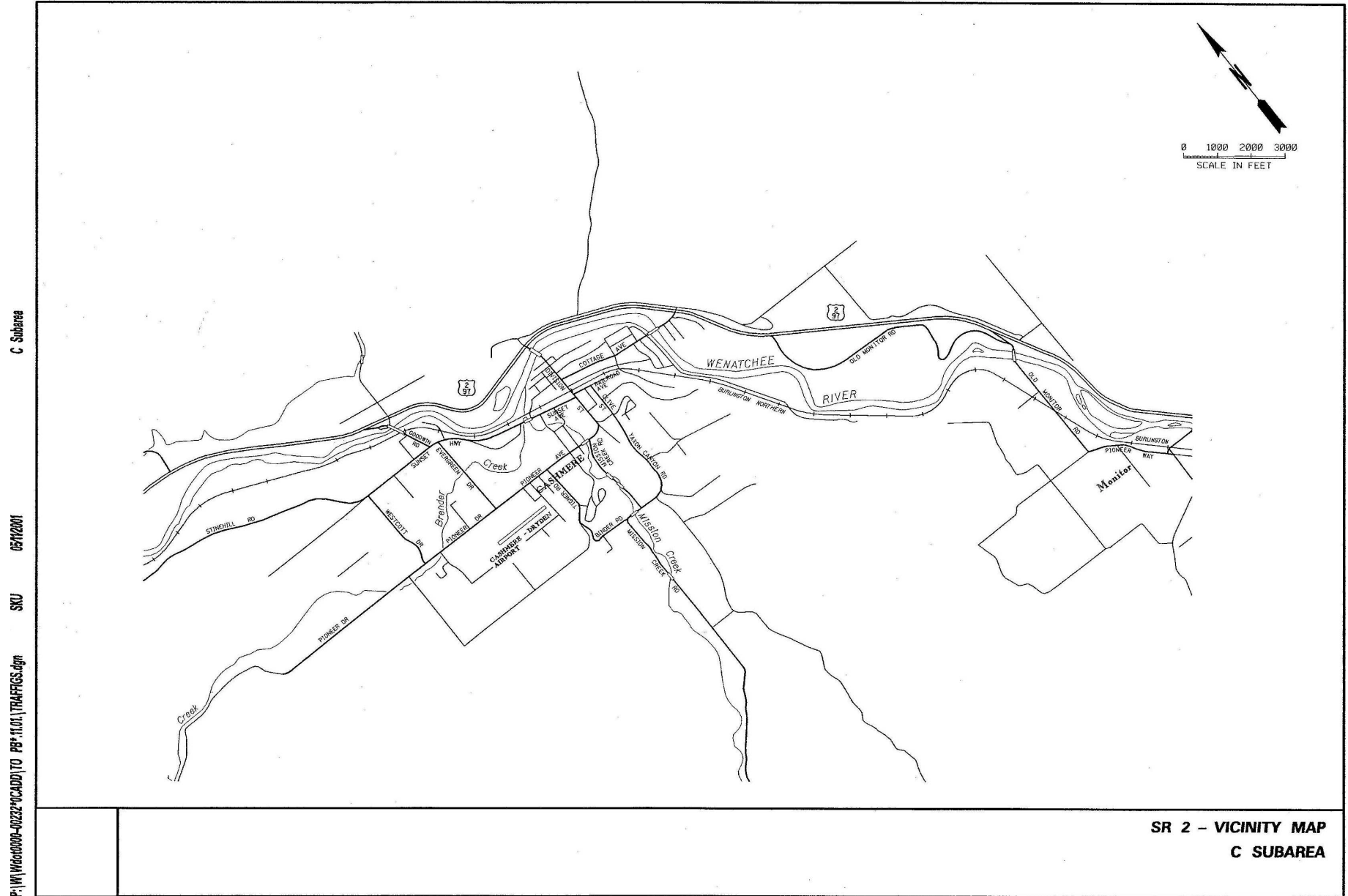


Figure 2-2. Network Connections



DE Subarea



SKU

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4. Deadman Hill Road/Johnson Road: This route runs south of the highway from the Saunders/Deadman Hill Road intersection. Deadman Hill Road intersects with Johnson Road, which leads back to the highway at the Dryden Road/Stinehill Road intersection. Deadman Hill Road is a winding two-lane road with minimal shoulders.
5. Alice Avenue/Main Street/Dryden Avenue: Main Street is one of the main streets through the town of Dryden. It passes through an industrial area where fruit storage buildings and their associated parking/loading areas are at grade with and open to Main Street without any curb or sidewalks. Dryden Avenue is the other main street through Dryden and is lined with small businesses and residences.
6. Alice Avenue/North Road/North Dryden Road: This route is on the north side of the highway. It can also be accessed by Dryden Avenue via Main Street. North Road is a curvy roadway, two lanes in width near the west end and approximately one and a half lanes in width on the east end. There are very steep slopes on the downhill side. This roadway currently carries very low traffic volumes. This route from US 2/97 at Alice Avenue to US 2/97 North Dryden route is over three miles.
7. Dryden Avenue/Stinehill Road/Old State Highway/Sunset Highway/Goodwin Road: This route is on the south side of the highway. This route also continues from Sunset Highway through Cashmere where the highway can be accessed either by Aplets Way or Cotlets Way. Stinehill Road is a two-lane striped roadway that is posted at 45 MPH. Stinehill Road turns into Old State Highway and is posted at 35 MPH as it approaches Cashmere. Continuing into town, Sunset Highway is stop-controlled at Aplets Way. The highway can be accessed by Aplets Way west of downtown or by Cotlets Way east of downtown. The access via Cotlets Way passes through the downtown and residential areas.
8. Driveway location (private road) between the intersections of Goodwin Road and Aplets Way: To the south of the highway, this is the only access for one to two properties. To the north of the highway, a narrow gravel road/driveway turns past the house at this location, through adjacent orchard land, then connects with Nahahum Canyon Road near the Aplets Way intersection.
9. Aplets Way/Nahahum Canyon Road/North Cashmere Road/Cotlets Avenue: This route is on the north side of the highway. Nahahum Canyon Road, which turns into North Cashmere Road, is a two-lane roadway with no shoulders. North Cashmere Road is stop-controlled in the westbound direction at Nahahum Canyon Road.
10. Cotlets Avenue/Eels Road/Hughes Road/Red Apple Road: This route is north of the highway. It can either be accessed from the Cotlets Avenue, or can be continued from the previous roadway network. Eels Road is a narrow roadway varying from two lanes in width to approximately one and one half lanes in width traveling eastbound. At the intersection of Hughes Road, the roadway widens back to two lanes in width with a striped centerline.
11. Red Apple Road (western)/Selfs Road/Red Apple Road (eastern): This route is north of the highway. It can either be accessed off of the western Red Apple Road intersection or can be continued from the previous roadway network. Selfs Road is two lanes in width without shoulders. There are two large culverts crossing under this roadway.
12. Old Monitor/Old State Highway/Red Apple Road: This route is south of the highway and is accessed by a right turn only from US 2/97. Left turns onto this roadway from the highway are prohibited, though left turns from Old Monitor Road onto the highway are allowed. Old State

Highway, between Old Monitor Road and Red Apple Road, is a two-lane striped roadway with shoulders.

13. Red Apple Road/Old Monitor Road/Pioneer Way/Main Street: This route is south of the highway. It can be accessed either by Red Apple Road, by continuing on the previous route, or by Stoffel Road. Stoffel Road is a one-way exit from eastbound US 2/97 connecting with Old Monitor Road at an acute angle near the north end of the West Monitor Bridge, and is a two-lane roadway without shoulders or striping. Old Monitor Road through this area is a two-lane roadway without shoulders or striping. Old Monitor Road crosses the river on an old, one-way bridge with additional wood planking. On the east side of the river the roadway narrows to approximately one and one half lanes wide. Throughout this stretch, a painted centerline is sporadic. Old Monitor Road is stop controlled where it meets with Pioneer Way. It then continues into the town of Monitor (posted speed of 25 MPH), past an industrial area before reaching Main Street. There is a stop control at Main Street, with an immediate railroad crossing. Main Street continues across the river before connecting with the highway.
14. Main Street/Easy Street/Lower Monitor Road: This route is north of the highway. Main Street/Easy Street passes through a light commercial/industrial area with a Link bus stop on the south side of the road. Easy Street is a striped two-lane roadway with shoulders, which is posted at 40 MPH. It crosses one large culvert before connecting to Lower Monitor Road at a “Y” intersection. Lower Monitor Road is a downgrade approaching US2/97 with a steep shoulder on the downhill side.
15. Lower Monitor Road/Easy Street/School Street: This route is north of the highway, and can be accessed off Lower Monitor Road or continued from the previous roadway network. Easy Street is a striped two-lane roadway with shoulders, which is posted at 40 MPH. There is a flashing yellow warning signal at the intersection of School Street. School Street is a two-lane roadway with no shoulders, but a sidewalk on the east side continuing past the school.
16. School Street/Easy Street: This route is north of the highway (when US 2/97 is in the east/west direction) and west of highway (when US 2/97 is in the north/south direction). It can be accessed from School Street or can be continued from the previous roadway network.
17. Main Street/Sleepy Hollow Road/Lower Sunnyslope Road: This route is on the south side of the highway. Sleepy Hollow Road is a two-lane winding roadway with no striping (except for a short segment). It is stop-controlled at the intersection with Lower Sunnyslope Road. This route is over two miles long.
18. Lower Sunnyslope Road/West Penny Road: This route is on the south side of the highway and can either be accessed off of Lower Sunnyslope Road or can be continued from the previous route. Lower Sunnyslope Road is fairly narrow with steep slopes on the downhill side. West Penny Road connects with US 2/97 at the junction of SR 285.

TRAFFIC SAFETY REVIEW

Existing Traffic Data

Washington State Patrol (WSP) collision data for reported accidents along US 2/97 in the project study area was provided by the Washington State Department of Transportation (WSDOT). This data was reviewed for the years from 1994 to 2000 and provides time, location, and type information for each collision. However, the data from 1997 to 2000 has not been completely entered into the WSP database. It is estimated that approximately 30 percent of the records statewide still remain to be entered in the database. Further, the data that is available for 1997 to 2000 does not include information as to the number of injuries at each intersection, the roadway surface condition, and the roadway light level. The data does provide sufficient information to identify trends in accident types and problem locations.

Accident rates were calculated for each of the study area intersections based on the available 1994 to 1996 accident data. Accident rates provide a quantitative measure with which to compare the number of accidents relative to volume at an intersection or along a roadway corridor. The following equations are used for the calculation of accident rates:

$$\text{Intersection Accident Rate} = \frac{\left(\frac{\text{Total Number of Intersection Accidents}}{\text{PM Peak Hour}} \right) \times 1,000,000}{\left(\text{Entering Volume} \right) \times 10 \times 365 \frac{\text{days}}{\text{year}} \times 3 \frac{\text{years}}{\text{period}}} = \frac{\text{Accidents per Million Entering Vehicles (MEV)}}{\text{Million Entering Vehicles (MEV)}}$$

$$\text{Roadway Accident Rate} = \frac{\left(\frac{\text{Total Number of Accidents}}{\text{Average Daily Traffic}} \right) \times 1,000,000}{\left(\text{Average Daily Traffic} \right) \times 365 \frac{\text{days}}{\text{year}} \times 3 \frac{\text{years}}{\text{period}} \times (\text{Segment Length})} = \frac{\text{Accidents per Million Vehicle Miles (MVM)}}{\text{Miles (MVM)}}$$

The following discussion summarizes the types of accidents occurring at each intersection within the study area. Preliminary observations note that at some locations there are deficiencies in signing to alert drivers to changing roadway conditions. These warning signs would alert drivers when approaching unsignalized intersections with limited sight distance and signalized intersections requiring a complete stop from the 60 mile per hour posted speed.

Blewett Junction

The provided collision data shows 27 collisions between 1994 and 2000 at Blewett Junction. One fatality and seven injury accidents have been recorded since 1994 at this intersection. The fatality involved a westbound vehicle turning left onto southbound US 97 in 1996. The accident types at the intersection were:

- 15 rear-end collisions
- 8 left-turn collisions (1 fatal)
- 2 single-vehicle accidents
- 1 right-angle collision
- 1 overturned vehicle

Ten of the rear-end collisions involved vehicles travelling northbound on US 97 approaching US 2. Five of the left-turn collisions involved vehicles turning left from US 97 on the northbound approach to westbound US 2 and three turning left from the US 2/97 westbound approach to southbound US 97. Ice was recorded as a contributing factor in two of the collisions.

The collision data suggests that drivers are not anticipating the stop sign when approaching Blewett Junction from the south on US 97. An oversized stop-ahead warning sign with flashing beacons was placed on the northbound approach to the junction in 1985 and replaced in 1996.

Saunders Road/Deadman Hill Road/Foster Road

Collision data at the Saunders Road/Deadman Hill Road/Foster Road intersection indicates that ten accidents have occurred between 1994 and 2000. There was one fatality at the intersection that involved a pedestrian being struck by a vehicle in 1997. Additionally, six of the remaining collisions were noted as injury accidents. The accidents reported at the intersection were:

- 6 left-turn collisions
- 2 right-angle collisions
- 1 pedestrian-vehicle collision (fatal)
- 1 sideswipe collision

Eight of the ten accidents involved a vehicle turning off of or onto the Foster Road/Saunders Road (north leg) portion of the intersection. None of the collisions were reported to have occurred in icy conditions.

Limited sight distance from the Foster Road/Saunders Road side of the intersection as well as from the eastbound US 2/97 left-turn bay appears to be a problem at the intersection. The intersection is situated just east of the crest for a vertical curve and does not have any signs warning of the intersection for the US 2/97 approaches.

Motel Road/Dryden Transfer Station Road

Five accidents occurred at the intersection of Motel Road and the Dryden Transfer Station Road between 1994 and 2000. Three of the collisions were denoted as injury accidents and three were during icy or snowy conditions. No fatalities occurred at this location. The reported collisions were of the following types:

- 2 sideswipe collisions
- 1 single vehicle collision (struck object)
- 1 overturned vehicle
- 1 vehicle over the embankment

Jersey barrier has been placed in the median at this intersection, thus preventing left-turns from the Dryden Transfer Station onto US 2/97. The Motel Road connection is a very short westbound exit ramp approximately 120 feet in length. One safety concern noted was that there is a yield sign for traffic exiting US 2/97 at the intersection with Motel Road, yet the sign is difficult to see and the traffic coming off of US 2/97 appears to brake rapidly.

Alice Avenue

At the Alice Avenue intersection, two accidents were reported between 1994 and 2000. Both of these collisions were right-angle collisions occurring in 1998 and 1999. No fatalities were reported, but one of the collisions was reported as an injury accident.

Dryden Road/Johnson Road

Between 1994 and 2000, 17 accidents occurred at the intersection of Dryden Road/Johnson Road and US 2/97. There was one reported fatality in 1995, which was a right-angle collision. Twelve of the collisions were reported as injury accidents and only one collision was reported to have occurred during icy conditions. The following accident types were reported at this intersection:

- 8 right-angle collisions (1 fatal)
- 3 left-turn collisions
- 3 sideswipe collisions
- 2 rear-end collisions
- 1 single vehicle collision (struck object)

Six of the eight right-angle collisions involved a vehicle from the south leg of the intersection. Intersection ahead warning signs are not present to advise US 2/97 traffic of the intersection. The presence of a slight S-curve approaching the intersection from the west causes drivers on US 2/97 to not be able to see the approaching traffic and causes drivers on Dryden Road/Johnson Road to accept gaps in traffic that are not fully safe.

North Dryden Road/Pinnacle View Road

At North Dryden Road/Pinnacle View Road, two accidents were reported between 1994 and 2000. One accident was a rear-end collision; the other was a vehicle colliding with an animal or bird. The rear-end collision was reported as an injury accident.

Goodwin Road/Hay Canyon Road

Between 1994 and 2000, 14 collisions have been reported at the Goodwin Road/Hay Canyon Road intersection. One fatality occurred at the intersection involving a left-turn collision in 1995. Six of the accidents were reported as injury accidents and one was reported to have occurred during icy conditions. The reported accident types were:

- 10 left-turn collisions (1 fatal)
- 2 rear-end collisions
- 2 right-angle collisions

Six of the left-turn collisions involved a vehicle turning left from Goodwin Road, three involved a vehicle turning left onto Goodwin Road and one involved a vehicle proceeding northbound across US 2/97 from Goodwin Road.

One problem with the intersection is limited sight distance to the east from the northbound approach as well as a large roadway segment to cross. "Intersection Ahead" warning signs are lacking for this intersection. The existing bridge structure at Goodwin Road into Cashmere is narrow and shows signs of damage from vehicles hitting the side railing.

Aplets Way

Between 1994 and 2000, 13 collisions occurred at Aplets Way. One fatal collision was reported between a vehicle and a pedestrian in 1999. Seven of the collisions were injury accidents and two occurred in icy or snowy conditions. Accidents reported at Aplets Way were of the following type:

- 5 rear-end collisions
- 4 right-angle collisions
- 2 single vehicle collisions (struck an object)

- 1 left-turn collision
- 1 pedestrian-vehicle collision (fatal)

Seven of the collisions involved a vehicle traveling northbound off of Aplets Way.

A signal is currently being installed at US 2/97 and Aplets Way. It is recommended that additional safety review be completed after the installation of the signal.

Cotlets Way

At Cotlets Way and US 2/97, 27 collisions occurred between 1994 and 2000. One rear-end fatal collision occurred in 1994. Ten of the collisions were reported as injury accidents and six were noted as to have occurred during icy or snowy conditions. The following accident types were reported at Cotlets Way:

- 11 rear-end collisions (1 fatal)
- 7 left-turn collisions
- 4 sideswipe collisions
- 3 single vehicle collisions (struck object)
- 2 right-angle collisions

Seven of the accidents involved a vehicle exiting the south leg of the intersection and seven involved a vehicle entering the south leg of the intersection. The intersection of Titchenal Way and Cotlets Way is just immediately south of the intersection of Cotlets Way and US 2/97 and has heavy truck volumes. This adjacent intersection is likely to be a contributing factor to the collisions described above.

Old Monitor Road

Six accidents were reported at Old Monitor Road between 1994 and 2000. One fatality was reported at the intersection, a head-on collision in 1998 where a driver turned into the wrong lanes of US 2/97 from Old Monitor Road and got trapped on the wrong side of the median barrier. One of the accidents was reported as an injury accident. The following accident types were reported at the intersection:

- 2 rear-end collisions
- 2 single vehicle collisions (1 struck an object, 1 struck an animal or bird)
- 1 right-angle collision
- 1 head-on collision (fatal)

Both rear-end collisions occurred with vehicles traveling eastbound on US 2/97.

Red Apple Road/Old Monitor Road

Two accidents were reported between 1994 and 2000 at Red Apple Road/Old Monitor Road. One accident was a right-angle collision; the other was a single vehicle colliding with an object. The right-angle collision was an injury accident.

Red Apple Road/Selfs Road

Between 1994 and 2000, four collisions were reported at Red Apple Road/Selfs Road. Two collisions involved a single vehicle striking an object, one involved a single vehicle striking an animal or bird, and one was a right-angle collision. Three of the accidents were injury accidents and one was reported to have occurred during snowy conditions.

Main Street/Easy Street

Reported collisions totaled 30 at the intersection of Main Street/Easy Street between 1994 and 2000. In 1997, a fatality was reported involving a left-turn collision at this intersection. Injuries were reported for 12 of the accidents and icy or snowy conditions were noted for three. The following accident types were reported at Main Street/Easy Street:

- 10 left-turn collisions (1 fatal)
- 7 rear-end collisions
- 6 right-angle collisions
- 3 single vehicle collisions (struck object)
- 2 vehicle overturns
- 2 sideswipes

Of the reported accidents, 12 involved vehicles from the northbound approach and 13 involved vehicles from the westbound approach.

The traffic signal at the intersection of Main Street/Easy Street and US 2/97 was installed in 1998. Due to the presence of a pedestrian overpass, the westbound signal heads are partially obstructed for westbound traffic. WSDOT is currently installing advanced warning signs that indicate the need for a driver to stop when amber beacon lights are flashing, which is hoped to alleviate some of the problems related to stopping for signal changes and the obstructed signal heads. It appears that many of the safety problems were addressed with the installation of the traffic signal, leaving some problems with speed and reaction time still to be addressed at this intersection.

Lower Sunnyslope Street

The intersection of Lower Sunnyslope Road and US 2/97 had ten reported accidents between 1994 and 2000. Three of the accidents were injury accidents and two were reported during icy roadway conditions. The following accident types were listed for this intersection:

- 4 single vehicle collisions (struck an object)
- 3 right-angle collisions
- 2 rear-end collisions
- 1 sideswipe collision

Poor sight distance from the side street approaches to US 2/97 was identified upon field visit.

The southbound approach to the intersection appears that it could be confusing to motorists. Lower Sunnyslope Road on the north side of US 2/97 has four lanes, with two southbound and two northbound. The southbound to westbound US 2/97 right turn lane is beside the eastbound US 2/97 left-turn to northbound Lower Sunnyslope receiving lane. On the east side of this lane is a southbound through and left-turn lane with a westbound US 2/97 right-turn to northbound receiving lane again on the east side. This would be expected to have a relatively high accident problem if volumes on the north leg of the intersection increased significantly.

School Street

Between 1994 and 2000, there were 14 collisions reported at the School Street intersection. No fatal accidents were reported at this location. Eight of the collisions were injury accidents and one was reported during icy conditions. The following accident types were reported at this intersection:

- 6 left-turn collisions

- 4 rear-end collisions
- 1 right-angle collision
- 1 sideswipe collision
- 2 single vehicle collisions (1 struck object, 1 struck “other”)

Six of the collisions involved vehicles from the southbound approach and nine from the westbound approach.

Easy Street

The intersection of Easy Street and US 2/97 was reported to have 27 collisions between 1994 and 2000. None of the reported accidents were fatal collisions. Ten of the collisions were reported as injury accidents. The following is a list of the accident types at this location:

- 16 rear-end collisions
- 6 right-angle collisions
- 5 left-turn collisions

One of the right-angle collisions involved a vehicle and a bicycle. Thirteen of the accidents involved a vehicle from the northbound approach of Easy Street.

The signal at Easy Street originally had a double left-turn from northbound Easy Street to westbound US 2/97. The channelization has recently been modified to now be a single left-turn lane, thus reducing some of the left-turn collisions and lane-use confusion at the intersection. Further signal modifications may minimize the rear-end collisions.

Figures 3-1, 3-2, and 3-3 display the accident data for the intersections in the study area. The information shows the number of reported accidents for 1994 through 2000, the accident rate for the years 1994 through 1996 (in accidents per MEV), and the sum of the peak hour approach volumes at each intersection. The accident rates were calculated with data from a shorter period than the total data set because of incomplete accident records between 1997 and 2000.

Between Intersections

Collisions along the roadway segments were also reviewed to determine potential safety improvements to mainline US 2/97. The majority of collisions along mainline US 2/97 are single vehicle accidents. These accidents involve vehicles striking roadway appurtenances, birds or animals, and various other objects in addition to vehicles overturning, driving into a ditch, or driving over an embankment. Hazardous driving conditions created by ice or snow on the roadway is a factor in some of these collisions. The high travel speeds coupled with little warning of icy conditions plays a large role in the single vehicle collisions in the corridor. Ice and snow removal treatments are used throughout the corridor to minimize safe driving conditions.

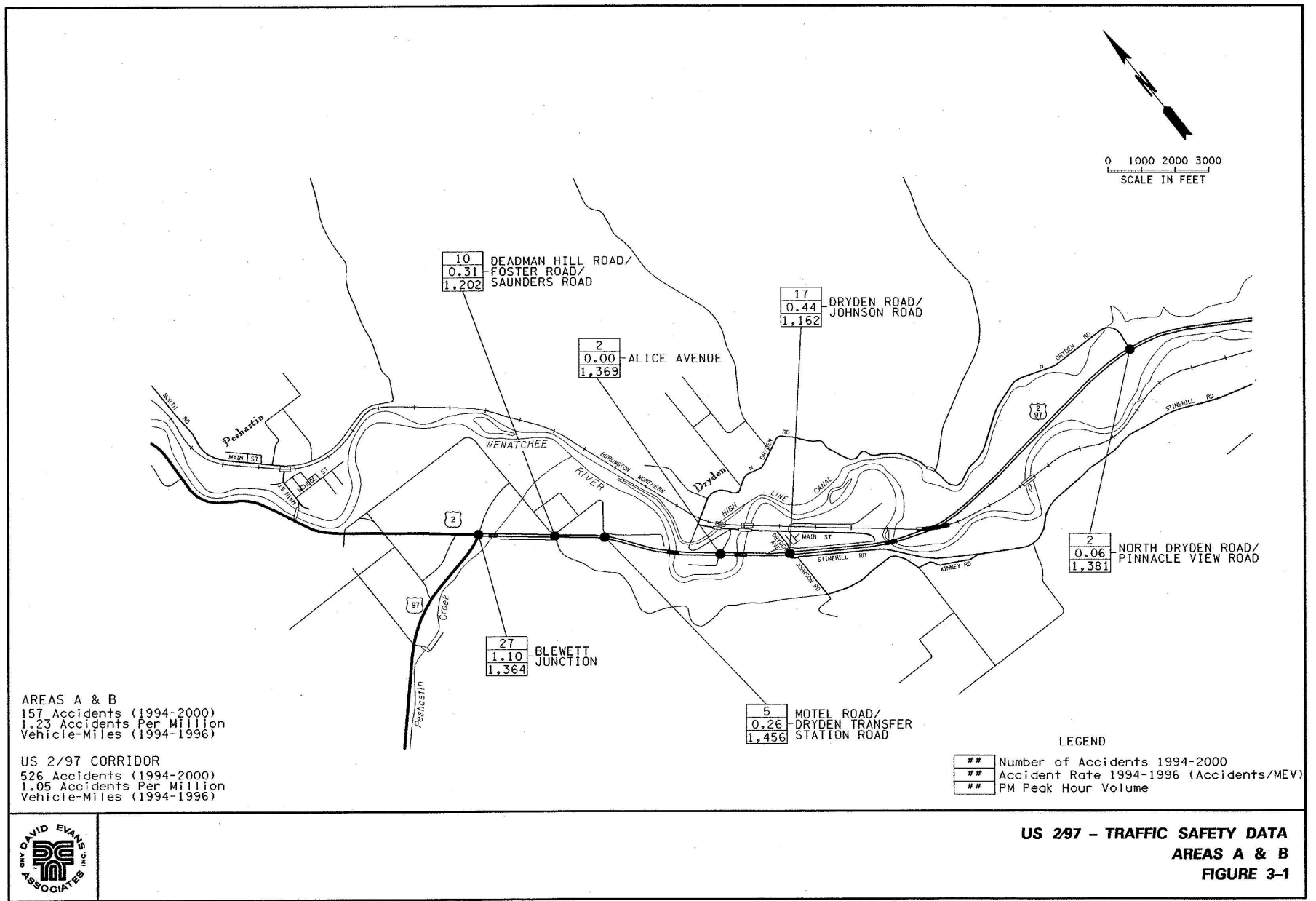
Many of the single vehicle collisions occur due to vehicles striking deer that are crossing the roadway. Data provided by WSDOT shows that 227 deer were reported killed from a vehicle collision between 1994 and 2000. A high incidence of deer-vehicle collisions occurred between Dryden Road and Aplets Way, between Cotlets Way and Red Apple/Old Monitor Road, and between Red Apple Road/Selfs Road and Main Street/Easy Street.

Safety Summary

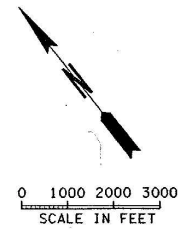
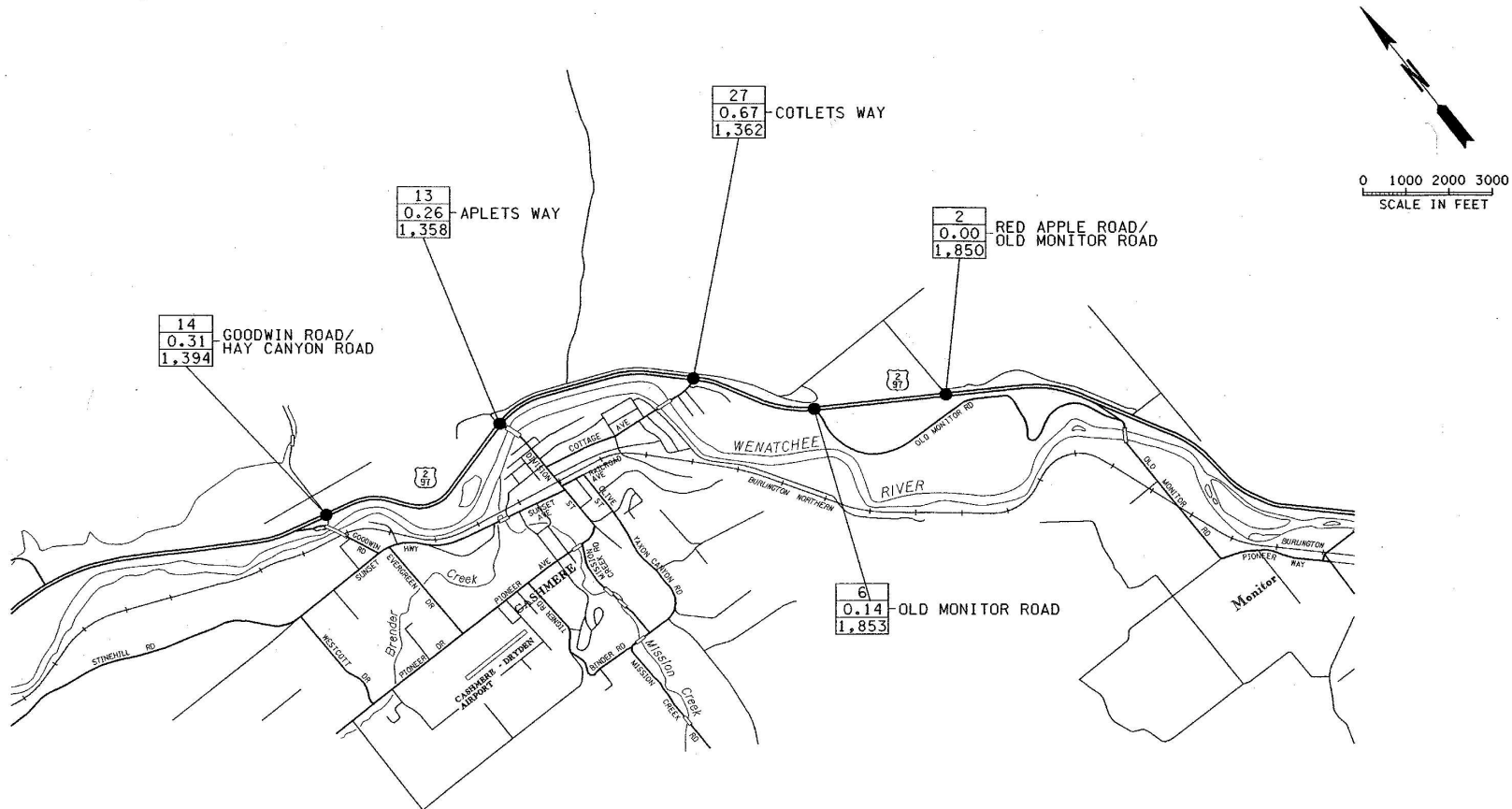
WSP accident data throughout the corridor was examined. It was found that each of the three signalized intersections had 27 or more accidents between 1994 and 2000 as did Blewett Junction. The predominant accident types at the intersections include rear-end, left-turn, and right-angle collisions. **Table 3-1** summarizes the accident types by intersection. Between intersections, single vehicle accidents were the predominant type. It is anticipated that the number of collisions at each location can be reduced through potential improvements.

Table 3-1. Accident Summary by Intersection

	Rear-end Collision	Left-turn Collision	Head-on Collision	Right-angle Collision	Sideswipe Collision	Overtaken Vehicle	Vehicle Over Embankment	Single Vehicle Collision	Pedestrian-Vehicle Collision	Total
Blewett Junction	15	8		1		1		2		27
Saunders Road/Deadman Hill/Foster Road		6		2	1				1	10
Motel Road/Dryden Transfer Station Road					2	1	1	1		6
Alice Avenue				2						2
Dryden Road/Johnson Road	2	3		8	3			1		17
North Dryden Road/Pinnacle View Road	1							1		2
Goodwin Road/Hay Canyon Road	2	10		2						14
Aplets Way	5	1		4				2	1	13
Cotlets Way	11	7		2	4			3		27
Old Monitor Road	2		1	1				2		6
Red Apple Road/Old Monitor Road				1				1		2
Red Apple/Selfs Road				1				3		4
Main Street/Easy Street	7	10		6	2	2		3		30
Lower Monitor Road/Lower Sunnyslope Road	2			3	1			4		10
School Street	4	6		1	1			2		14
Easy Street	16	5		6						27



Area C
 Location
 Date
 Information



AREA C
 66 Accidents (1994-2000)
 1.03 Accidents Per Million
 Vehicle-Miles (1994-1996)

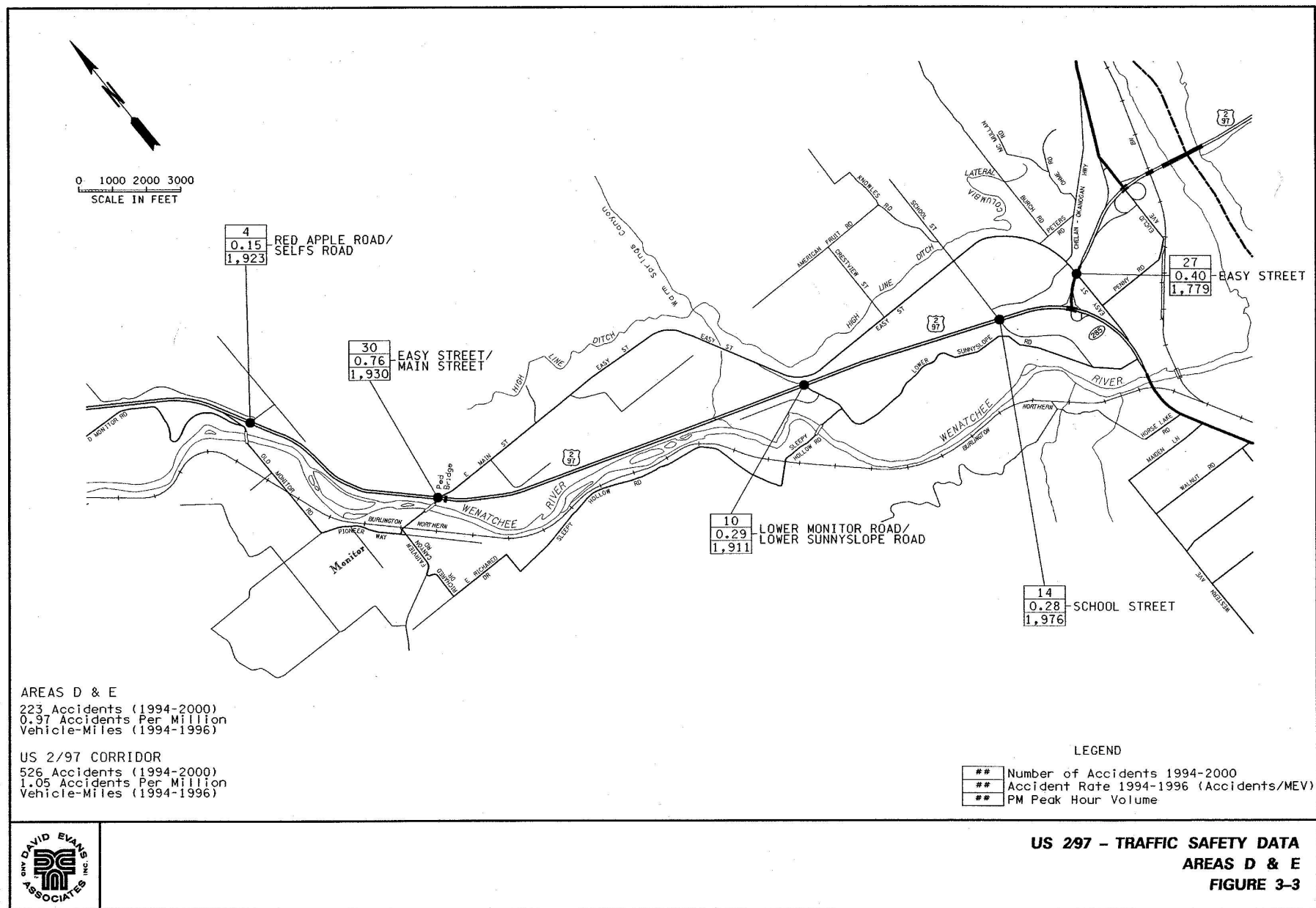
US 2/97 CORRIDOR
 526 Accidents (1994-2000)
 1.05 Accidents Per Million
 Vehicle-Miles (1994-1996)

LEGEND

##	Number of Accidents 1994-2000
##	Accident Rate 1994-1996 (Accidents/MEV)
##	PM Peak Hour Volume



**US 297 - TRAFFIC SAFETY DATA
 AREA C
 FIGURE 3-2**



TRAFFIC FORECASTS

Traffic forecasts and resulting growth factors for the US 2/97 corridor study area are required to estimate future conditions and to project individual intersection turning movements for the 2021 horizon year. Of particular interest is how the at-grade highway intersections will function in the future, and whether or not the expected peak hour operation or level of service at each intersection will pose additional safety problems that may warrant improvements, including grade separated interchanges. To this end, a traffic forecasting model was developed, and the resulting forecasts were used to assign peak hour intersection movements.

Traffic Forecasting Methodology

The corridor study area extends along US 2/97 from Easy Street in Wenatchee west to the US 97 junction with US 2, and includes 16 highway intersections. Although WSDOT and Chelan County maintain a TMODEL-based traditional, four-step process travel demand model, the results from a major update are not yet available, and in any event, the model is focused on the Wenatchee urban area and, thus, covers only the eastern edge of the project study area. Without access to transportation network forecasts based upon land use and demographic projections, transportation planners often resort to relatively simple growth trends taken from observed traffic volumes at two or more different points in time. However, it was recognized that these simple methods base future growth entirely on the historical trend between two points in time, which may not be representative, and thus do not always yield reliable forecasts over a 20-year horizon. Moreover, such methods have no ability to account for the underlying causes of the trend.

As a result, the more refined approach taken for this study was to develop a set of time-series regression models that would predict future traffic volumes based upon historical traffic data and the history and projections for available “explanatory variables.” This approach generally requires several historical observations for traffic and variables likely to predict traffic. All available traffic data for the study area corridor were obtained from the WSDOT Automated Data Collection office and its various publications. From the data collected, two locations in the corridor were identified where traffic data was readily available or could be pieced together over a sufficiently long enough time period to facilitate modeling. Annual average daily traffic (AADT) histories were assembled from 1979 through 2000 for US 2/97 just east of the junction with US 97 (presently the location of permanent traffic recorder number R047E) and for US 2/97 east of Cashmere’s Red Apple Road (presently the location of permanent traffic recorder number P01). Data for additional locations were not consistently available for every year, and though data in recent years can be broken down into monthly or quarterly average daily volumes, most of the identified explanatory variables were only available as annual figures.

History and forecasts for several countywide explanatory variables were available for consideration, including population, employment, civilian labor force, retail sales, real price of gasoline, and total and per capita measures of personal income as well as wage and salary income. The process of developing a time series regression model for traffic requires diagnostic testing of several combinations of variables, including logarithmic and other transformations of the data. Some variables, such as retail sales, were eliminated because the data was incomplete over the 1979 to 2000 period. Others were eliminated because forecasts were not available and/or there was no reasonable way to arrive at future values. In a few cases, an explanatory variable, which proved to be a reasonable candidate, ended up being too closely correlated with another variable where the latter resulted in a better fit. For example, population and employment tend to be highly correlated with each other so that in some cases, it is impossible to distinguish the individual statistical effects of each when both are included in a model specification. In

the end, unique models were specified for the two traffic data locations selected for the corridor (east of the US 97 Junction and east of Cashmere).

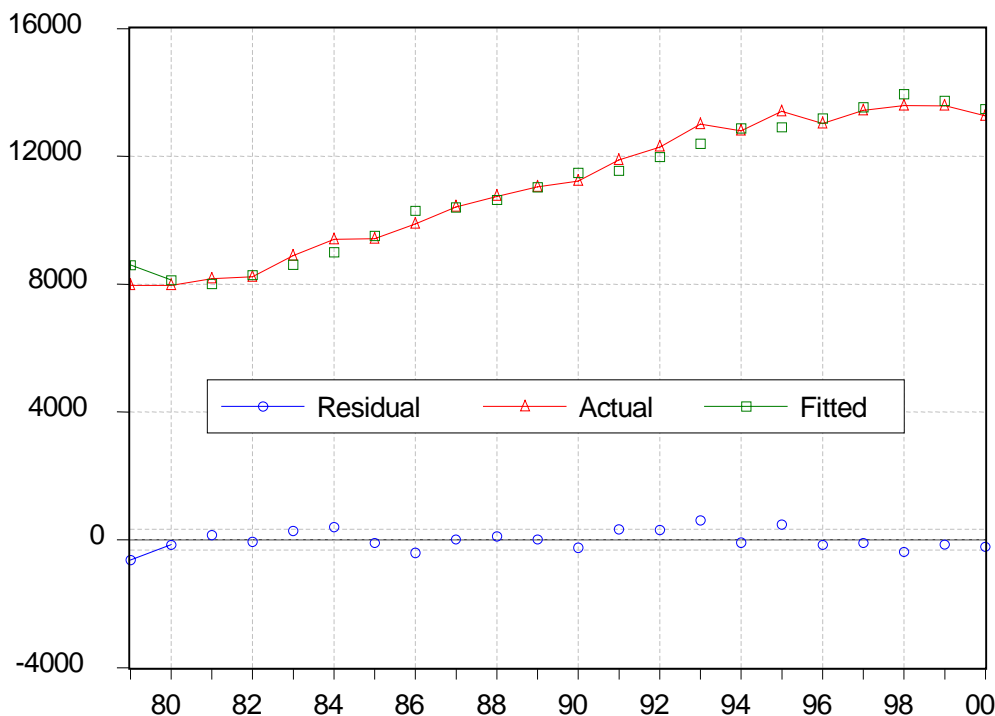
US 2/97 East of the US 97 Junction

Traffic in the west end of the corridor appeared to be slightly more predictable than in the east end, probably because of the less dense development patterns and likely reduced variability in trip purposes, especially discretionary trip purposes which are more difficult to predict. A traffic forecasting model as a function of the following was specified:

$$\text{AADT} = f(\text{Constant, Chelan Co. Employment, Chelan Co. Population, Real Price of Gasoline})$$

As would be expected, AADT varies positively with the level of employment and population within the county, and inversely with the real price of gasoline, which serves as a proxy for the variable cost of travel. This specification is consistent with local area growth generating traffic and also captures how all trips, though especially longer distance or out-of-area trips, can vary with the cost of travel. For the period between 1979 and 2000, each of these three explanatory variables was statistically significant, and collectively, the specified model for this location tracks or “explains” 97 percent of the trend and variation in AADT. **Figure 4-1** shows the actual traffic data and the model predicted or “fitted” values for this period. The residual line shows the difference between the actual and fitted values for each year’s AADT observation.

Figure 4-1. Traffic Model Fit of Historical AADT for US 2/97 East of US 97 Junction



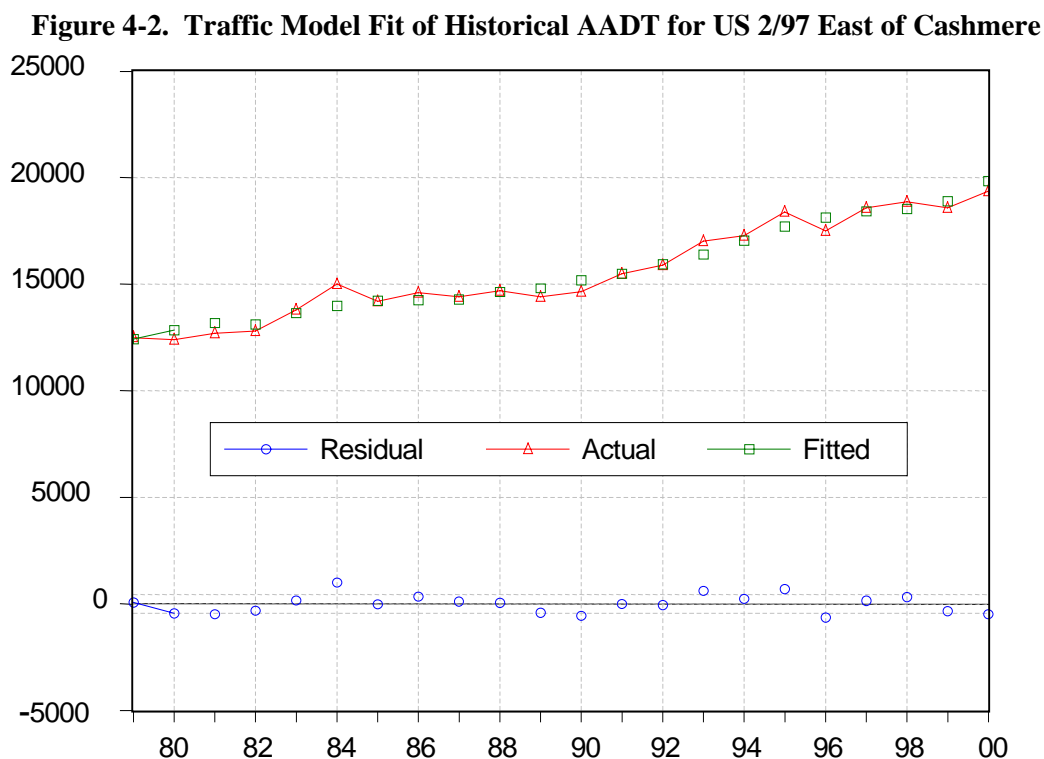
US 2/97 East of Cashmere

Locations in the corridor that are closer to Wenatchee have more development and easier access to the urban retail center, which often results in a higher share of shorter distance and discretionary trips, in

addition to work commute trip purposes and longer distance through traffic, which are seen throughout the corridor. The same explanatory variables used in the model for the US 97 junction location also had strong explanatory power at this location. However, a statistical problem known as multi-collinearity made it impossible to ascertain their individual effects on traffic at this location when two or three of the variables were combined in the same model. Therefore, it was necessary to identify which of the three explanatory variables was most robust, and discard the other two. Of the three, statistical tests indicated that population provided the best fit, and thus the following specification was adopted:

$$\text{AADT} = f(\text{Constant, Chelan Co. Population})$$

As the variable with the best explanatory power, Chelan County population accounted for 96 percent of the trend and variation in historical AADT at the east of Cashmere location. **Figure 4-2** shows the actual traffic data and the model predicted or “fitted” values at this location from 1979 through 2000. The residual line shows the difference between the actual and fitted values for each year’s AADT observation.



Traffic Forecast Results

The traffic models developed to predict AADT at the two locations were then used to forecast future daily volumes on US 2/97. This required projections for the explanatory variables. U.S. Census results were used to update Washington State Office of Financial Management (OFM) population history for the year 2000, which was then compared to the OFM projection for Chelan County in 2020. Projections for 2001 through 2019 and 2021 were interpolated and extrapolated, respectively to complete the population forecast by year. The employment history for Chelan County, which also originates from OFM, was then projected by the annual growth rates expected in the Office of the Forecast Council’s (OFC) overall state employment forecast, since a specific Chelan County projection was not currently available over a 20-

year horizon. Finally, the forecast series for the real price of gasoline was calculated from projections for the Implicit Price Deflator for Personal Consumption (a general inflation index) and the Implicit Price Deflator for Gasoline (a nominal gasoline price index) prepared by OFC and the WSDOT Economics Branch with input from McGraw Hill Data Resources Inc.

Table 4-1 summarizes the corridor traffic projections at the two identified locations at five 10-year intervals from 1981 through 2021. More detailed traffic forecast results are presented in Appendix C. Note that the cumulative growth factor for 2001 to 2021 at US 2/97 east of the US 97 junction is 1.337, reflecting expected annual average daily traffic growth of 33.7 percent over this 20-year period. For US 2/97 east of Cashmere, a higher growth factor is anticipated at 1.463; this translates into 46.3 percent growth in AADT by 2021. The higher growth rate in traffic is consistent with expected county growth patterns, particularly toward the eastern end of the corridor.

Table 4-1. Corridor Study Area Traffic Forecasts & Growth Factors for 10-Year Intervals

<i>Year</i>	<i>US 2/97 East of US-97 Jct</i>		<i>US 2/97 East of Cashmere</i>	
	<i>Annual Average Daily Traffic (AADT)</i>	<i>AADT Forecast Cumulative Growth Factor</i>	<i>Annual Average Daily Traffic (AADT)</i>	<i>AADT Forecast Cumulative Growth Factor</i>
1981	8,170	—	12,700	—
1991	11,887	—	15,489	—
2001	13,771	—	20,247	—
2011	16,462	1.195	24,518	1.211
2021	18,407	1.337	29,617	1.463
2001-2011	+ 2,691	1.195	+ 4,271	1.211
2011-2021	+ 1,945	1.118	+ 5,099	1.208
2001-2021	+ 4,636	1.337	+ 9,370	1.463

Table 4-2 summarizes the corridor traffic forecasts by vehicle type, grouping two-axle trucks (SUVs, pickups, and delivery trucks) with autos and separately identifying trucks with three or more axles and combination vehicles. Additional detail can be found in Appendix C.

Table 4-2. Corridor Study Area Traffic Forecasts by Vehicle Type for 10-Year Intervals

<i>Year</i>	<i>US 2/97 East of US-97 Jct</i>				<i>US-2 @ East of Cashmere</i>			
	<i>Annual Average Daily Traffic (AADT)</i>	<i>Autos & Single Unit Trucks</i>	<i>Combination Unit Trucks / Percentage of AADT</i>		<i>Annual Average Daily Traffic (AADT)</i>	<i>Autos & Single Unit Trucks</i>	<i>Combination Unit Trucks / Percentage of AADT</i>	
1981	8,170	7,598	572	7.0%	12,700	12,065	635	5.0%
1991	11,887	11,055	832	7.0%	15,489	14,715	774	5.0%
2001	13,771	12,807	964	7.0%	20,247	19,234	1,012	5.0%
2011	16,462	15,309	1,152	7.0%	24,518	23,292	1,226	5.0%
2021	18,407	17,174	1,233	6.7%	29,617	28,165	1,451	4.9%
2001-2011	+ 2,691	+ 2,503	+ 188		+ 4,271	+ 4,058	+ 214	
2011-2021	+ 1,945	+ 1,864	+ 81		+ 5,099	+ 4,873	+ 225	
2001-2021	+ 4,636	+ 4,367	+ 269		+ 9,370	+ 8,931	+ 439	

Application of AADT Forecasts to Peak Hour Intersection Analyses

Intersection counts that served as the basis for the subsequent future baseline intersection analyses were conducted during several weekdays in August 2000. Since the objective is to forecast future intersection movements during the peak hour, it was necessary to test whether or not the AADT growth factors could be directly applied to the August peak hour intersection volumes, or would need to be factored to account for possible different growth trends. Therefore, the growth patterns of historical AADT, August average daily volumes, and August peak hour volumes were compared between 1993 and 2000 using data from the permanent traffic recorder located just east of Cashmere, the only data available at this detail over several years.

As it turned out, the growth rates for August daily traffic and August peak period traffic from 1993 to 2000 were virtually identical, and where differences existed, they served to offset each other, leading to the conclusion that it was appropriate to apply the future AADT growth factors to grow the peak hour intersection volumes out to the 2021 horizon year.

The peak hour intersection movements from the Blewett Cutoff Road intersections on both US 2 and US 97 at the west end of the corridor to North Dryden Road west of Cashmere were factored up by 33.7 percent to reach 2021 volumes based upon the traffic model for east of the US 2 junction with US 97. The remaining intersections from Goodwin Road/Hay Canyon Road to Easy Street in Wenatchee were factored up by 46.3 percent to 2021 volumes based upon the results from the model for US 2/97 east of Cashmere. Resulting intersection volumes are shown in Appendix D. Detailed information about the intersection analyses and future volumes are presented in the next section.

FUTURE BASELINE OPERATIONS

To evaluate future baseline traffic operations, the PM peak turning movements counts from 2000 were forecasted to the year 2021 using the methodology described in the previous section. After the forecasting factors were applied to each intersection, a “reality” check was done for each movement of each intersection to verify that the forecasted volumes seemed probable. Appendix D shows how the growth factors were applied for each intersection and any modifications that were made. The resulting forecasted volumes are shown in **Figure 5-1** along with the existing channelization for each intersection.

Level of Service Analysis

The Highway Capacity Software (HCS) 2000 was used to analyze the 2021 baseline conditions. The following tables display the anticipated LOS calculated for unsignalized (stop controlled) intersections, signalized intersections, ramp sections and roadway segments along US 2/97. It should be noted that HCS does not take into account any unusual features, therefore at intersections with non-standard approaches, the anticipated operations may not be accurately represented by the analysis results. LOS falling below the WSDOT minimum LOS C is noted in bold text in each of the subsequent tables.

Table 5-1. Level of Service for Unsignalized Intersections

	US 2/97 EB	US 2/97 WB	Northbound			Southbound			Approach LOS	
	Left	Left	Left	Thru	Right	Left	Thru	Right	NB	SB
US 97 and Blewett Cutoff	A*					B**		A**		A**
US 2 and Blewett Cutoff/Doghouse Road	A	A		E			D		E	D
US 2 and Jeske Road/US 97	A	B		F	F***		F	B	F***	F
Saunders Road/Deadman Hill Road/Foster Road	B	B		F			F		F	F
Motel Road/Dryden Transfer Station Road									B****	
Alice Avenue	B	B		E			F		E	F
Dryden Road/Johnson Road	A	B		F			F		F	F
North Dryden Road/Pinnacle View Road	B	B		B			F		B	F
Goodwin Road/Hay Canyon Road	B	B		F			F		F	F
Old Monitor Road				E					E	
Old Monitor Road/Red Apple Road	C	B		F			F		F	F
Red Apple Road/Selfs Road	B						F			F
Lower Sunnyslope Road	C	B		F			F	C	F	F
School Street	C	B		F			F		F	F

* Northbound for the US 97/Blewett Cutoff Intersection

** Eastbound for the US 97/Blewett Cutoff Intersection

*** HCS unable to accurately analyze exclusive receiving lane for NBR

**** No volumes for the side street movements. LOS is solely based on available gaps in the mainline traffic.

All stop-controlled intersections within the project limits are anticipated to fall below WSDOT's minimum LOS C except for the following locations:

- US 97 and Blewett Cutoff: This intersection is anticipated to operate at LOS A mainly due to relatively low volumes on US 97. Through volumes on US 97 during the peak hour are forecasted to be less than 650 for both directions as compared a minimum of 1500 on US 2/97.

- Motel Road/Dryden Transfer Station: At this intersection both of these side streets have restricted movements with barrier down the median of US 2. In addition, Motel Road is one-way road leading away from the highway. There are no recorded turning volumes at this intersection in the PM peak, therefore the LOS is based on the presence of acceptable gaps on the mainline regardless of the number of vehicles entering from the side streets.
- North Dryden/Pinnacle View Road: The northbound approach for this movement is anticipated to operate at LOS B. This approach, Pinnacle View Road, is a dead end road serving only a few homes and an orchard. During the PM peak it is estimated that only a few vehicles will use this approach.

The poor LOS predicted at the majority of these stop-controlled intersections along US 2/97 illustrates the difficulty that motorists will have in finding acceptable “gaps” when crossing this multi-lane highway. Note that the intersection of Aplets Way is not included in the above table as the installation of a traffic signal will be completed this summer.

HCS ramp analysis was used to analyze the expected operations of the slip ramps for eastbound US 2/97 to Goodwin Road and eastbound US 2/97 to Stoffel Road. The LOS anticipated for both of these locations is LOS B or better.

Figure 5-1. Future 2021 Traffic Volumes, Channelization and Peak Hour Used for Each Intersection

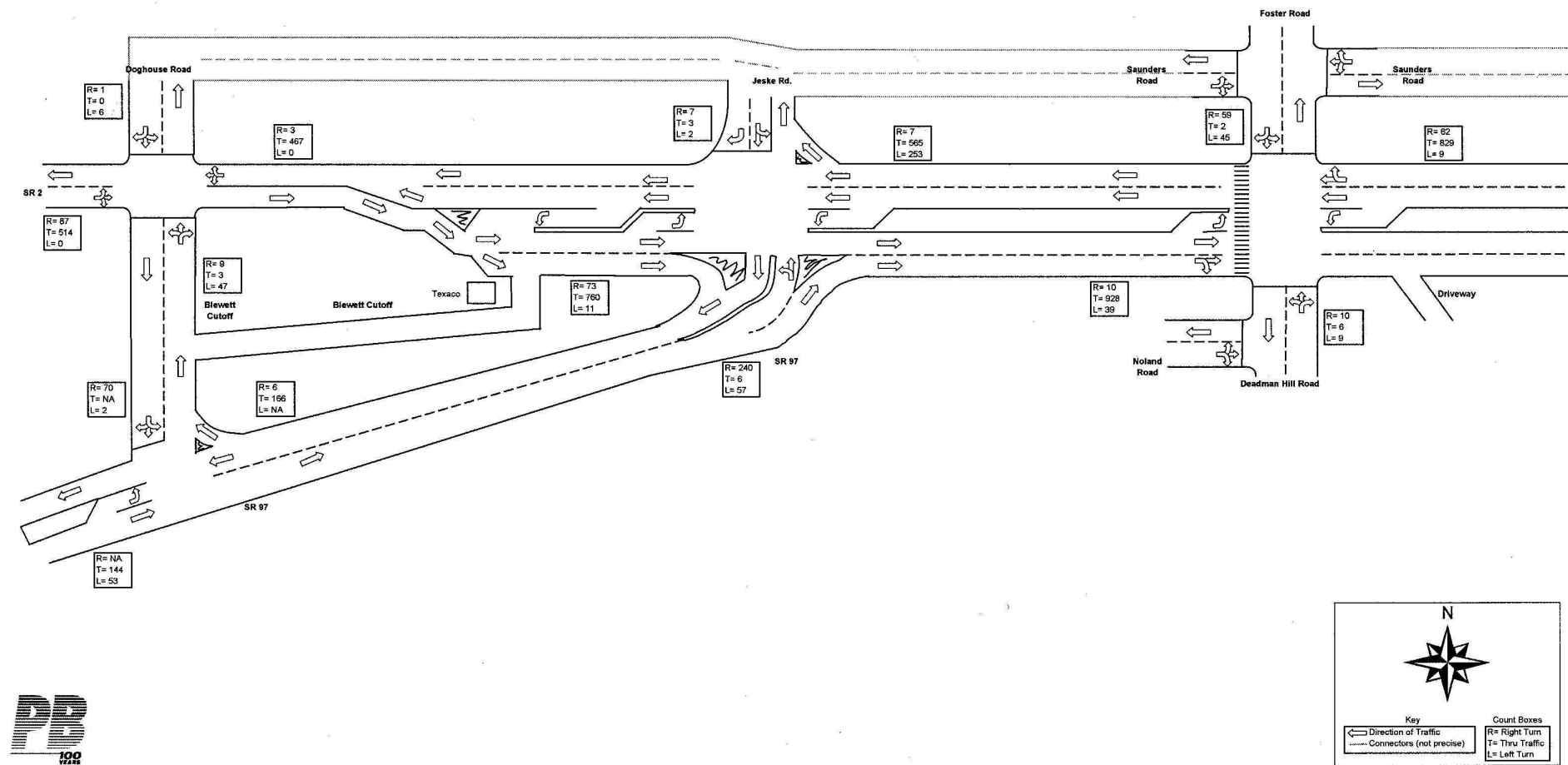


Figure 5-1. Future 2021 Traffic Volumes, Channelization and Peak Hour Used for Each Intersection (cont.)

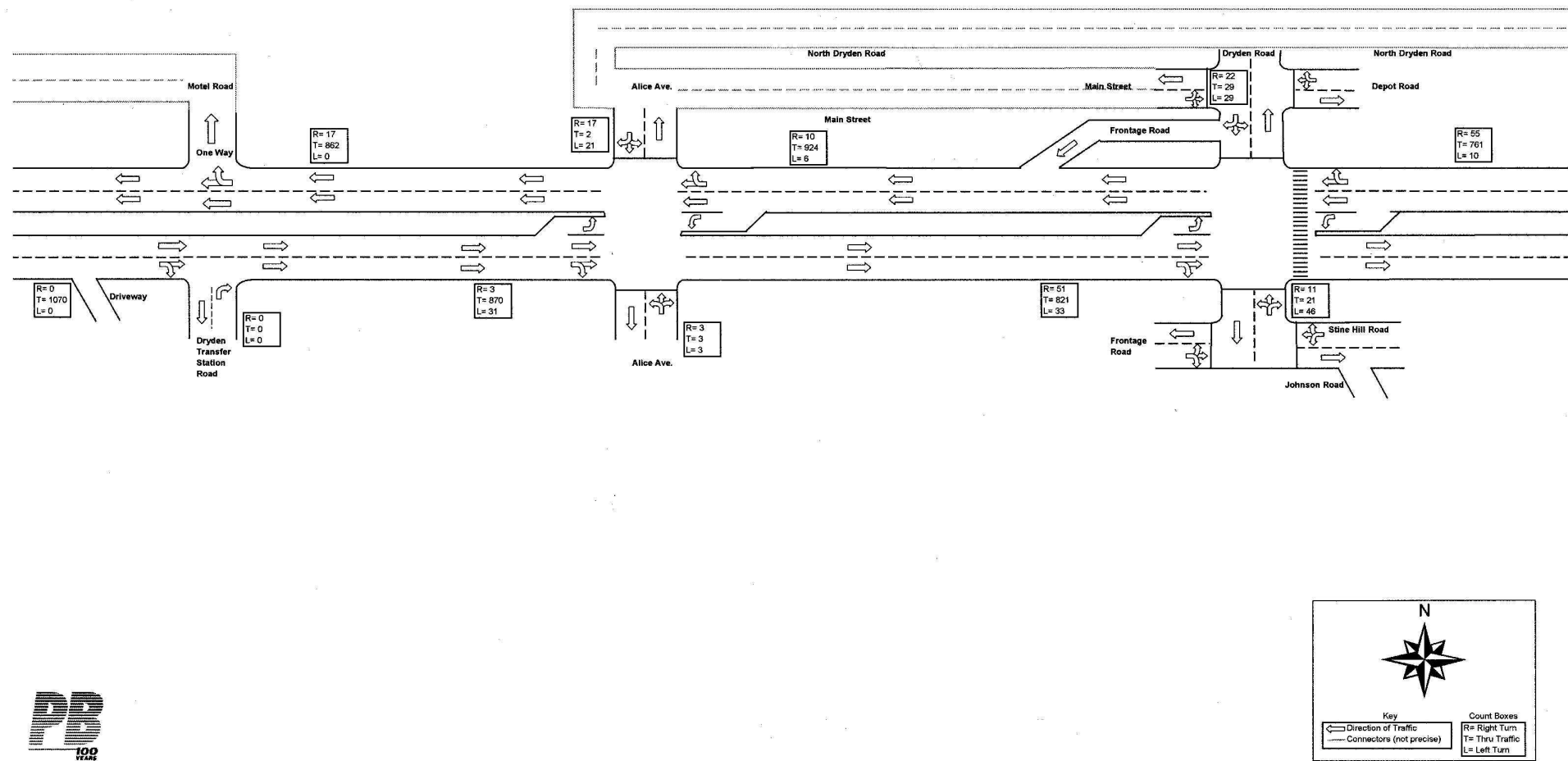


Figure 5-1. Future 2021 Traffic Volumes, Channelization and Peak Hour Used for Each Intersection (cont.)

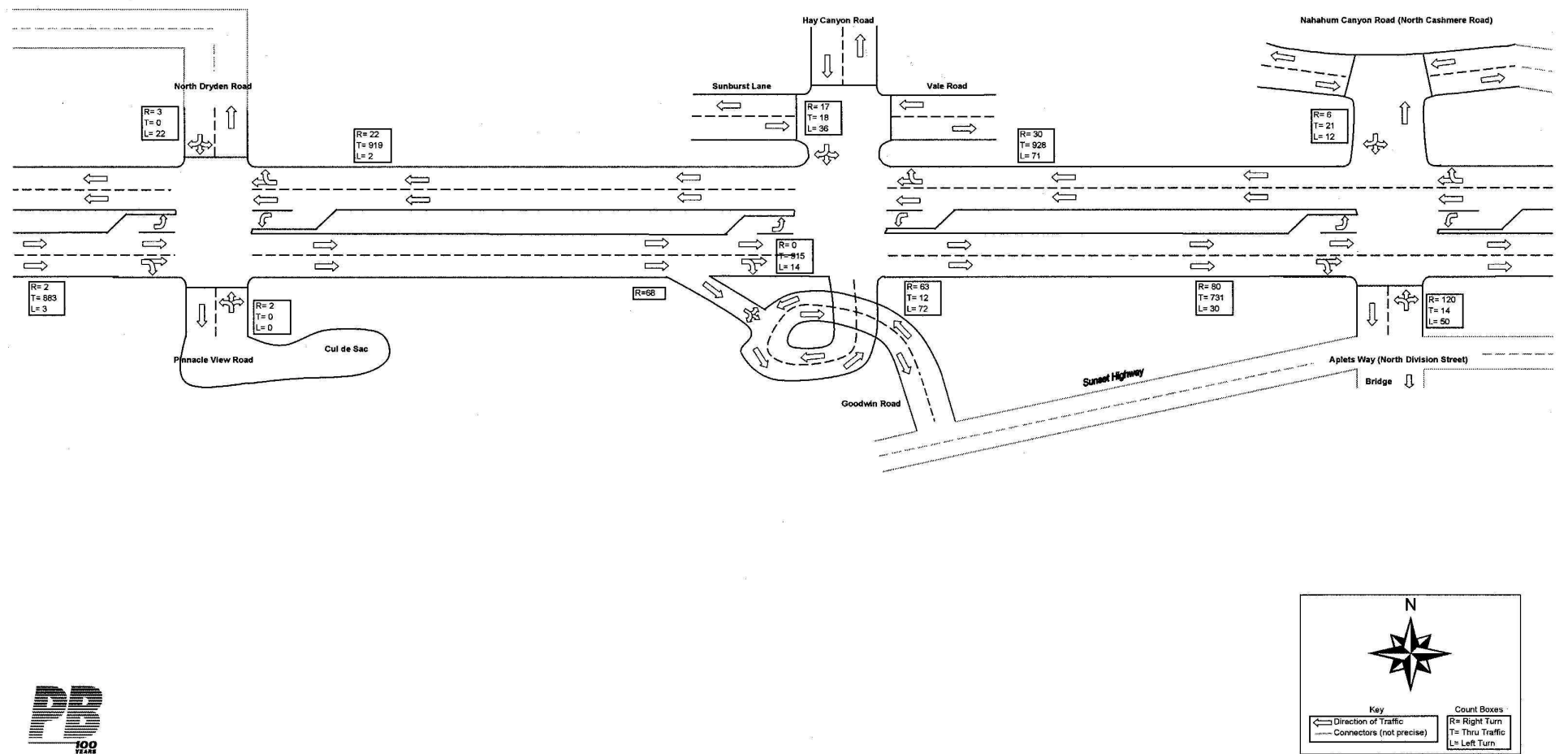


Figure 5-1. Future 2021 Traffic Volumes, Channelization and Peak Hour Used for Each Intersection (cont.)

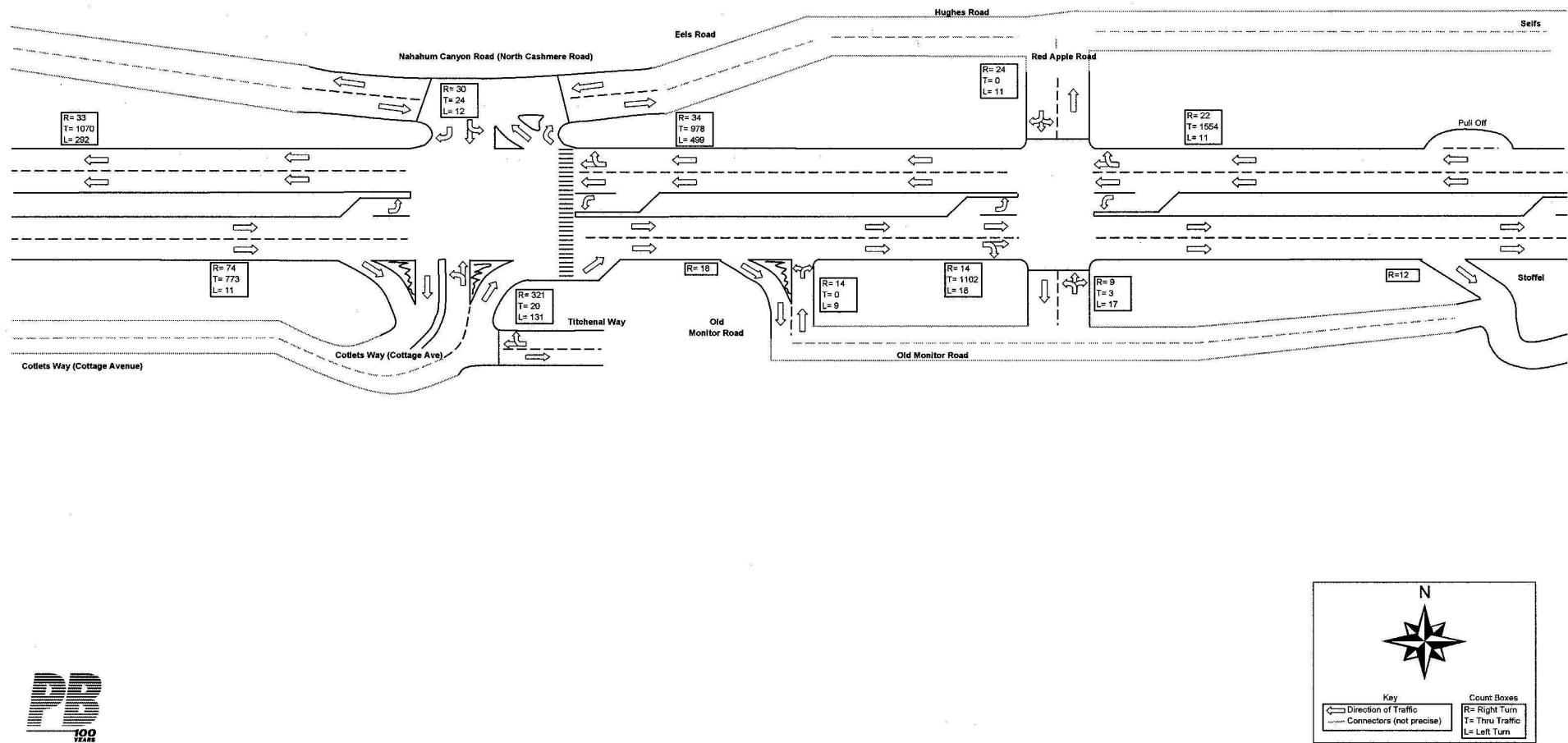


Figure 5-1. Future 2021 Traffic Volumes, Channelization and Peak Hour Used for Each Intersection (cont.)

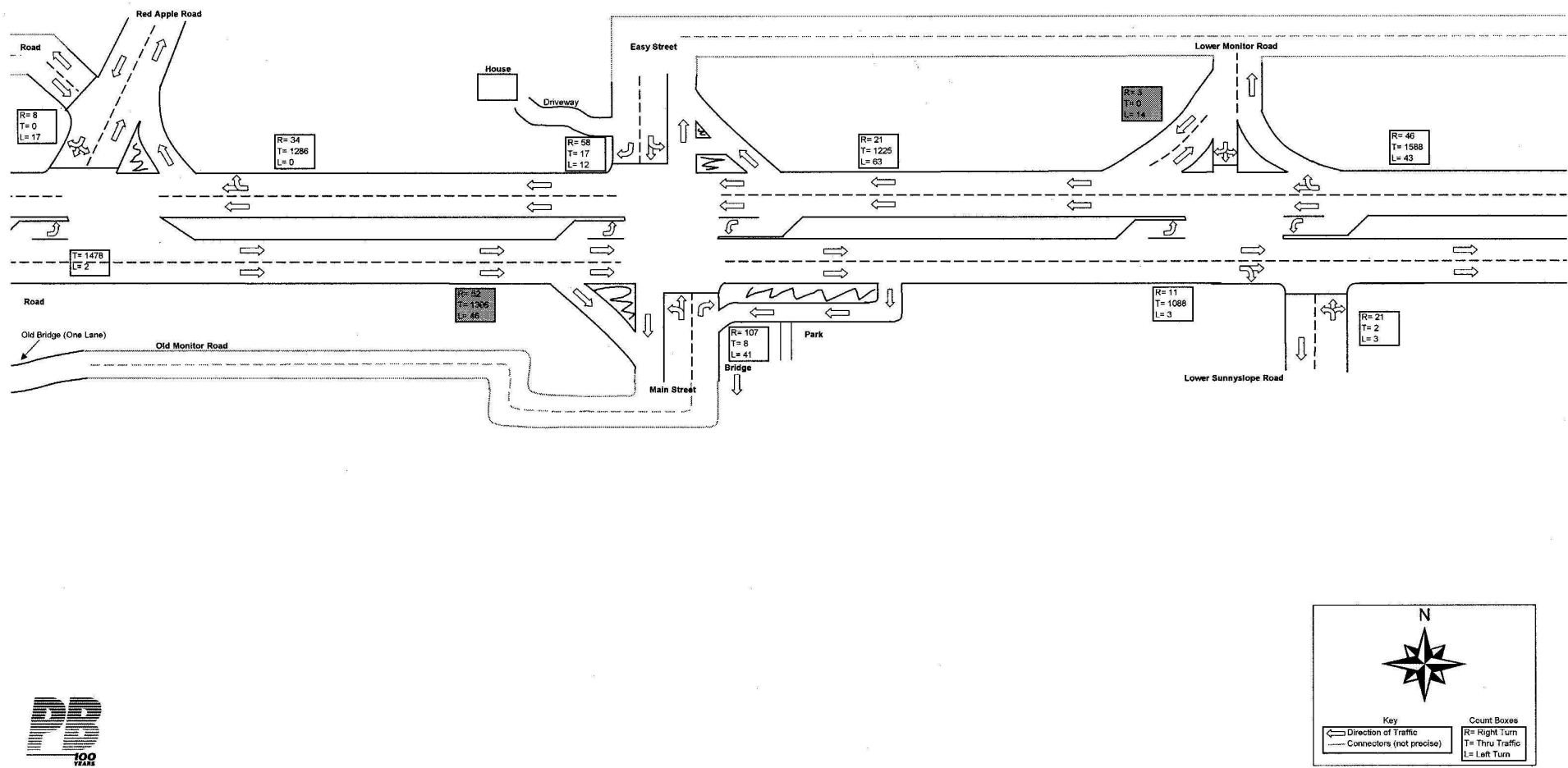


Figure 5-1. Future 2021 Traffic Volumes, Channelization and Peak Hour Used for Each Intersection (cont.)

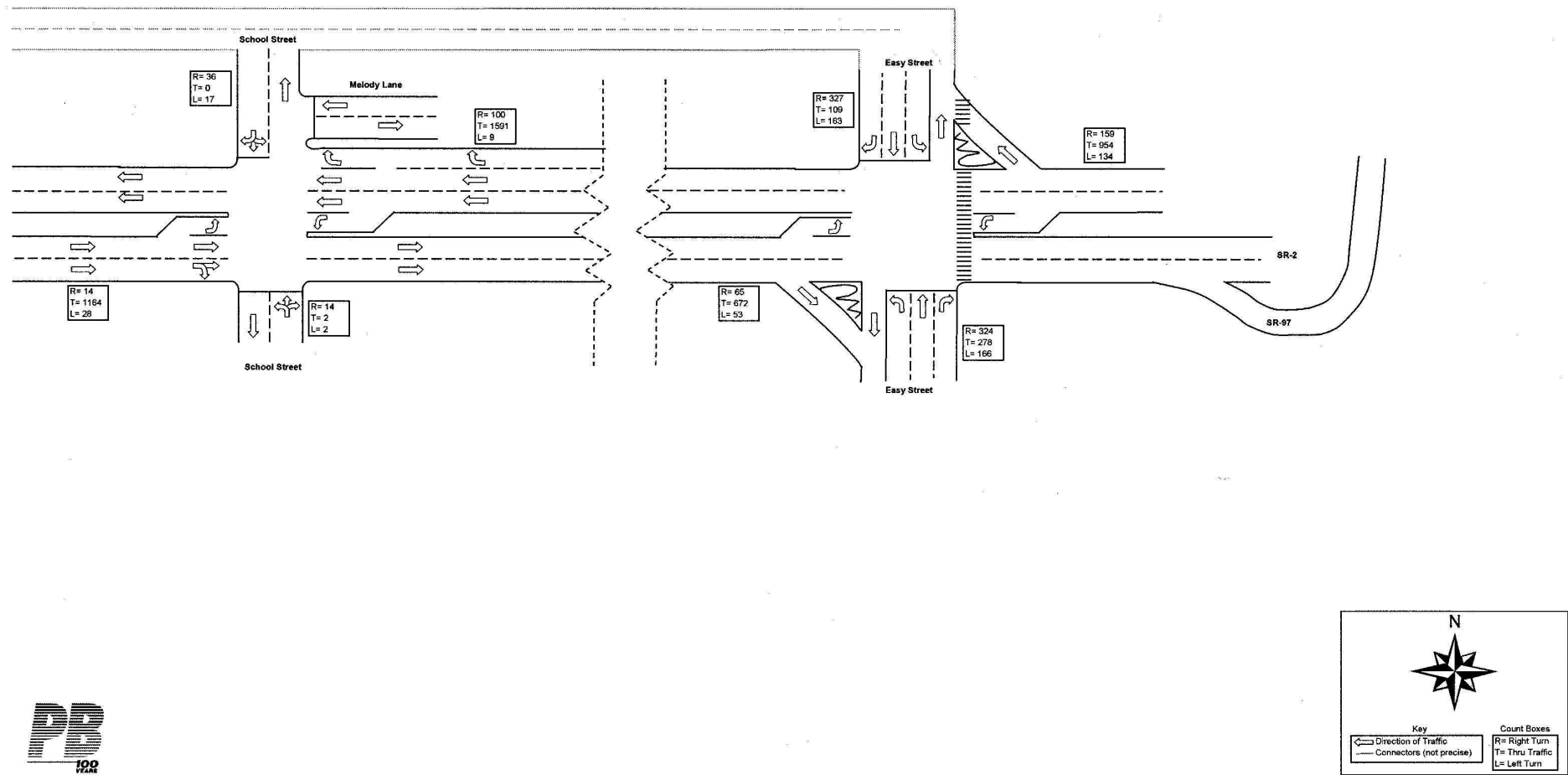


Table 5-2. Level of Service for Ramps

	Volume	LOS
Goodwin Road (eastbound)	68	A
Stoffel Road (eastbound)	12	B

As with the current traffic operations analysis, signal timings were initially developed using the planning feature of HCS. The resulting signal timings were then input into the operational feature of HCS and manually adjusted to calculate the best LOS based on the actual signal phasing.

Table 5-3. Level of Service for Signalized Intersections

	EB	WB	NB	SB	Intersection LOS	Intersection Delay (sec)
Aplets Way	C	B	C	B	C	21
Cotlets Way	E	D	D	D	E	57
Main Street/Easy Street	D	C	C	D	C	32
Easy Street (Wenatchee)	D	E	D	D	D	53

The Aplets Way signalized intersection and the Main Street/Easy Street signalized intersection are both anticipated to operate at an acceptable LOS (LOS C) in 2021. Once the Aplets Way signal is installed in 2001, it is predicted to operate at a LOS B with approximately 16 seconds of intersection delay, but degrade to a LOS C by the year 2021. The signals at both Cotlets Way and Easy Street should operate at LOS D or below. Note that HCS does not take into account the frontage road (Titchenal Way) on the south side of the Cotlets Way intersection, which also impacts signal operations. Therefore, the LOS shown for Cotlets Way is optimistic.

The results from the roadway LOS shown below indicate that the LOS should still be acceptable for through traffic on US 2/97 in 2021, ranging from a LOS A in the west end of the project to LOS C at the very east end of the project limits.

Table 5-4. Roadway Level of Service

	Eastbound		Westbound	
	Volume	LOS	Volume	LOS
Blewett Cutoff to Jeske Road	844	A	629	A
Jeske Road to Saunders Road	1002	A	897	A
Saunders Road to Motel Road	1070	A	900	A
Motel Road to Alice Avenue	1070	A	944	A
Alice Avenue to Dryden Road	905	A	940	A
Dryden Road to North Dryden Road	888	A	922	A
North Dryden Road to Hay Canyon Road	929	A	1017	A
Hay Canyon Road to Aplets Way	1014	A	1126	A
Aplets Way to Cotlets Way	863	A	1395	B
Cotlets Way to Old Monitor/Red Apple	1134	A	1589	B
Red Apple to Red Apple/Selfs Road	1480	B	1587	B
Red Apple to Main Street/Easy Street	1502	B	1324	B

	Eastbound		Westbound	
	Volume	LOS	Volume	LOS
Easy Street to Lower Sunnyslope	1517	B	1594	B
Lower Sunnyslope to School Street	1206	A	1677	B
School Street to Easy Street (Wenatchee)	1195	B	1700	C

The difference in anticipated LOS between the mainline movements (LOS A through LOS C) and side street approaches (mainly LOS D through LOS F) illustrate the unique challenges for this corridor. The mainline will operate below capacity while motorists on side streets will have difficulty accessing the highway. Not only does this cause significant delay for those attempting to enter the highway, but would cause potentially unsafe situations due to impatient motorists.

SUMMARY

The US 2/97 Corridor Safety Study is examining the existing and expected future conditions for US 2/97 between the Blewett Junction and Wenatchee. The corridor runs east-west, is 14.4 miles long and consists of 16 intersections. Three of the existing intersections are signalized, with a fourth signal system currently under construction. The mainline of US 2/97 predominantly includes two lanes in each direction with a center median and left-turn pockets at intersections. US 2/97 serves as the predominant east-west travel route and arterial in the corridor; no continuous secondary road network currently exists to serve the whole corridor. The speed limit for US 2/97 is 60 miles per hour, with an advisory speed of 50 miles per hour posted on one of the horizontal curves near Cashmere and a speed limit of 45 miles per hour from Easy Street to School Street. The design year for the study is 2021.

A LOS analysis for each of the intersections and for the roadway segments was also completed. In 2021, all of the unsignalized intersections are estimated to operate below the WSDOT standard of LOS D, except Motel Road/Dryden Transfer Station Road. The signalized intersections are estimated in 2021 to operate with LOS C, D, or E; the intersections at Cotlets Way and Easy Street are both anticipated to fail to meet WSDOT minimum LOS standards (LOS C). The LOS for the roadway segments are all between LOS A and C for the year 2021. The LOS analyses for the intersections are incapable of modeling the complex interactions that take place at some of the locations, such as how Saunders Road and Foster Road intersect just north of US 2/97 and how vehicle detection is included on Titchenal Way for the intersection of US 2/97 and Cotlets Way. Additionally, the roadway segment analyses do not account for the orchard access roads on US 2/97 nor do the analyses consider the horizontal and vertical curves. The presence of signalized intersections in the US 2/97 corridor also impacts the roadway LOS by increasing the number of platooned vehicles, thereby providing a slight benefit for entering US 2/97 from intersections near signals.

The safety review completed for the US 2/97 Corridor Safety Study revealed a pattern in accidents for the corridor. The predominant accident types for the unsignalized intersections were left-turn and right-angle collisions. Left-turn and rear-end collisions were the predominant type for signalized intersections. The roadway segments of US 2/97 are characterized by single-vehicle collisions, predominantly involving a vehicle striking an animal or bird.

Vehicular traffic in the corridor is forecast to grow between 33 and 47 percent by 2021. As the amount of travel increases, the LOS and safety in the corridor is expected to deteriorate. Design recommendations and changes need to consider how to balance the competing interests of maintaining acceptable LOS on the mainline, maintaining acceptable LOS on the minor street approaches, and increasing the safety of the corridor. Additionally, actions will need to be taken to correct existing deficiencies and improve existing conditions.

APPENDICES

NOTE: The appendices listed below are not included in website document. Please contact Kirk Berg, WSDOT Project Engineer at 509-667-2870, to review these appendices.

Appendix A - Current Traffic Operations Analysis Data

Appendix B - Safety Analysis

Appendix C - Corridor Traffic Forecasts

Appendix D - Forecasted Turning Movement Volumes

Appendix E – Future Baseline Operations Analysis Data